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Vol. XX, No. 2 FEBRUARY, 1931

JOURNAL

OF THE

AMERICAN PHARMACEUTICAL ASSOCIATION

TRADE MARK

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THE 79th ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION WILL BE HELD IN MIAMI, FLA., DURING WEEK OF JULY 27th. HEADQUARTERS, COLUMBUS HOTEL. LOCAL SECRETARY, G. H. GROMMET, 2364 S. W. 11th ST., MIAMI.

The 1931 Meetings of the American Association of Colleges of Pharmacy, the National Association of Boards of Pharmacy, Conferences of Pharmaceutical Association Secretaries and of Pharmaceutical Law Enforcement Officials will also be held at Miami, same time and place. The Plant Science Seminar will be held at Gainesville, Fla., during the week of July 21st.

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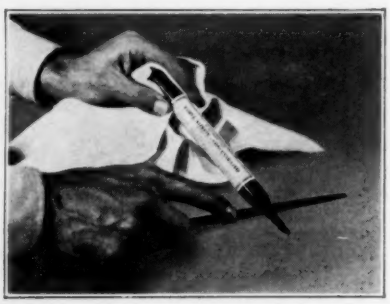

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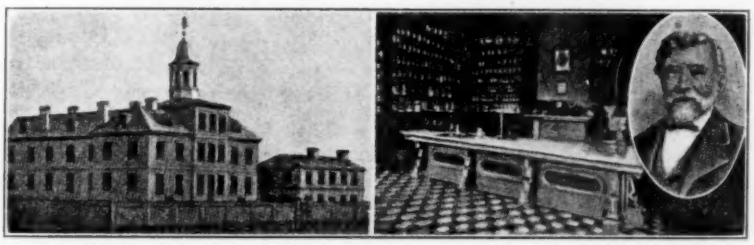
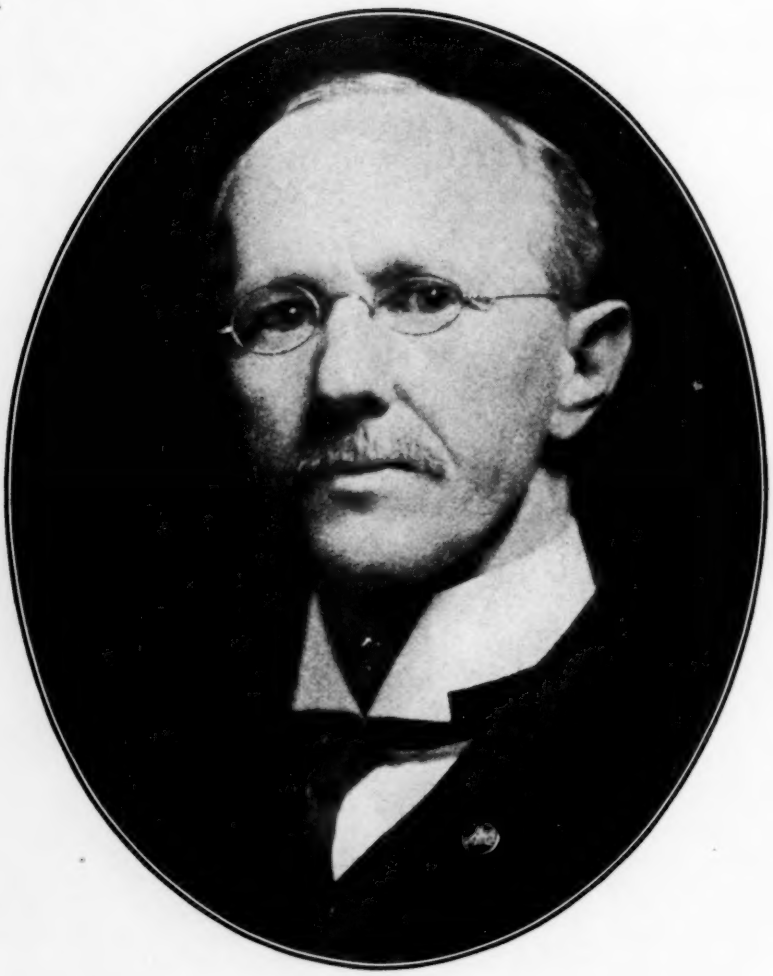
BEFORE completing his medical studies in Europe, Dr. John Morgan was pharmacist in the pharmacy of Pennsylvania Hospital, shown below. After his return, he assisted in organizing a medical school. He introduced in Philadelphia the practice of writing prescriptions, or, as he called it, "The regular mode of practicing physic." He strongly advocated the separation of pharmacy and of surgery from the practice of medicine proper, and argued, "We must regret that the very different employment of physician, surgeon and apothecary should be promiscuously followed by any one man; they certainly require different talents. Let each cultivate his respective branch apart, the physician, surgeon, apothecary, etc.; the knowledge of medicine will be then daily improved, and it may be practiced with greater accuracy and skill." Dr. Morgan, for a time, was in charge of the hospitals of the American Army.



Left—East wing of the Pennsylvania Hospital with "Elaboratory" on right, built in 1778. The Pharmacy of the Hospital is shown, with insertion of picture of Pharmacist John Conrad, 1831–1870. Here John Morgan was pharmacist and later physician. In the "Elaboratory," medicines were prepared for the American Army, as well as for the hospital.



JOHN H. HARDIN.

JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

VOL. XX FEBRUARY, 1931 No. 2

JOHN HAYWOOD HARDIN.

John Haywood Hardin became a member of the AMERICAN PHARMACEUTICAL ASSOCIATION in 1881, hence this is the 50th anniversary of his affiliation. He was born in Washington, D. C., July 31, 1853, the son of Lauriston Bonaparte and Augusta (Lane) Hardin. The parents of the subject of this sketch moved to Wilmington, N. C., while the son was still in his early teens. He received his academic education in General Colston's Military Academy, from 1869 to 1872. After completing his school work he served an apprenticeship with Dr. W. W. Lane and remained with him until 1875 when he engaged for a year in the pharmacy of Dr. T. S. Burbank. For four years thereafter he was employed in the pharmacy of J. K. McIlhenny, resigning to go into business on his own account under the name of Hardin's Pharmacy at 126 S. Front Street, Wilmington, where he actively and successfully has continued in business up to the present time.

The data for this brief sketch have been prepared from an article in the *Carolina Journal of Pharmacy* for April 1929. During that year Mr. Hardin was presented with a gold medal by the North Carolina Pharmaceutical Association in recognition of his 50 years of useful service and membership. The publication referred to considered it eminently fitting that a tribute be paid to one of the founders of North Carolina Pharmaceutical Association, to a pharmacist who had been a member of the organization since the initial meeting in Raleigh on August 11, 1880, and to a pharmacist who for more than fifty years has upheld the highest ideals of his profession. In appreciation of the long and devoted service to North Carolina pharmacy the number of the *Journal* referred to was dedicated to Mr. Hardin as an expression of the esteem and respect for the skillful pharmacist and courtly gentleman, one who has worthily gained the love and veneration of his fellow citizens, and who for more than fifty years has conscientiously and successfully practiced his profession in Wilmington.

On behalf of the ASSOCIATION congratulations are extended to "the fifty-year member" with the hope that he may continue successfully along the lines of his endeavor and enjoy many more years of usefulness, health and happiness.

EDITORIAL

E. G. EBERLE, EDITOR 10 West Chase Street, BALTIMORE, MD.

THE HOSPITAL PHARMACY, THE PHYSICIAN AND THE PHARMACIST.

AS HAS been stated in the January JOURNAL, the Congress of Medical Education, Licensure and Hospitals will be held in the Palmer House, Chicago, February 16th to 18th. Participating in the congress will be the Federation of State Medical Boards of the United States and the American Conference on Hospital Service.

Pharmacists should become more interested in hospitals, as citizens, and as pharmacists, for much work can be done, and is done whereby medicine and pharmacy profit, and the public benefits. A quotation from the *Journal A. M. A.* is repeated:

"In its work with hospitals it is the desire of the Council on Medical Education and Hospitals to coöperate in every way possible for the improvement of hospital service, whereby sick or injured people may be provided with the best possible care. The Council does not claim to have, nor does it assume any legal authority over any hospital, but recognizes clearly that the officers in charge of such institutions have the unquestioned right to conduct the hospitals in any way they deem wise. If a hospital desired to have the Council's endorsement, however, and that is what the Council's approval actually means, it should not be unwilling to comply with the principles which the Council deems necessary for such endorsement. The following essentials, or principles, have been prepared by the Council with the sole intention and desire of dealing with equal fairness to all institutions. A hospital seeking admission to the Register, therefore, should have the following qualifications:

"1. A staff made up of one or more properly qualified physicians who shall be graduates of reputable medical schools; and all physicians treating patients in the hospital must be so qualified.

"2. An able management which, depending on the size of the hospital, may be in the hands of a competent physician, an able superintendent, or a board of trustees.

"3. A competent physician-pathologist, either on the staff or easily accessible, who should examine and keep a careful record of tissues removed at all operations conducted in the hospital.

"4. Careful histories and records of all patients admitted to the hospital with which should be filed reports of any laboratory analyses, roentgen-ray findings or pathologic reports of any tissues examined.

"5. One or more competent nurses depending on the average number of its patients.

"6. Regular staff conferences, at least monthly and preferably weekly, in all hospitals having staffs of three or more physicians. At these staff conferences complicated cases in the hospital should be considered, as well as all deaths occurring in the hospital during the period intervening between meetings. If necropsies have been held on any of these patients, these especially should be given discussion in which antemortem and postmortem signs, symptoms and observations should be compared.

"7. Hospitals are institutions which should not be conducted for profit but for the purpose of securing better medical service for the community and they should always be conducted in accordance with the code of ethics of the American Medical Association."

The qualifications are essential, but should include requirements for a hospital pharmacy and qualified pharmacists. Dr. John Morgan's argument applies—physicians and pharmacists, as citizens and as professional men have obligations to the public and, as far as hospitals are concerned, this is one of them.

In the March JOURNAL A. PH. A. (1925), Henry J. Goeckel, consulting pathologist, Somerset Hospital, N. J., added the following summary to his paper:

"1. The hospital pharmacist is probably best qualified to undertake pharmaceutical and pharmacological investigations along the lines suggested.

2. This is work which supplements and extends that of the pharmacological laboratories.

3. It will aid in improving pharmaceutical service.

4. It will make therapeusis as applied to the use of pharmaceutical preparations more successful.

5. It will make pharmaceutical service of more value to the medical profession.

6. It will advance scientific and professional pharmacy.

7. It will win for the pharmacist his rightful place on the professional pharmacy.

8. It may ultimately lead to the Hospital Standardization Committees being just as insistent that the responsible members of the pharmaceutical staff should attend the clinical conference meetings as they now insist upon the responsible members of the pathological laboratory staff being present at these conferences."

We may wonder why the medical staff does not more strongly insist upon highest pharmaceutical provisions; why there seems to be more or less indifference in bringing pharmaceutical service to greater opportunities; but we, as pharmacists, must realize that it is the duty of all of the divisions of pharmacy to take a greater interest in such matters—that is the appeal of this comment. Several references heretofore made in other issues of the JOURNAL are repeated, because they are applicable.

Phoebe Miller Kandel, Director, Nursing Education Department of Public Welfare, Lincoln, Nebraska, is author of a valuable book on "Hospital Economics for Nurses," published by Harper & Brothers. In it a chapter is given to "The Pharmacy;" the following is quoted:

"The Personnel of the Pharmacy.—The personnel of the pharmacy should include a registered pharmacist, a registered assistant pharmacist and as many attendants as the pharmacist in charge feels he needs. The number of the personnel depends upon the demand of the hospital, the location of the ward drug rooms, and the system established for the transportation of the drugs and other supplies.

"In some of the hospitals of the United States that have accredited schools of nursing connected with them, a student nurse is assigned to the drug room for one or two months. It is thought that this experience is valuable if the work is organized and directed by a registered pharmacist, so that the student will be instructed and supervised in the preparation of solutions and weighing and measuring of drugs."

The foregoing shows the importance and at the same time, perhaps, an opportunity of systematizing pharmacies, so that there may be greater uniformity in the management of this important department.

We are also quoting the concluding article relating to "Suggestions for Managing the Pharmacy" from the recent volume, "Modern Hospital Year Book:"

"Because of the vital importance of the pharmacy in emergencies, it should be kept continuously open. The function of the pharmacy as an adjunctive aid to the physician and to the surgeon makes it one of the most essential departments of the hospital. It takes its place

with other staff services in the training of pupil nurses. Because its interrelationships with all other hospital departments are so intimate, the pharmacy (even though it be supervised by a competent and experienced pharmacist) deserves a considerable share of the time and attention of every hospital superintendent."

The following is from an article in the *Journal A. M. A.*, April 26, 1930, by our fellow member, William Gray, Pharmacist in Presbyterian Hospital, Chicago:

"The work of the hospital pharmacist differs materially from that of the pharmacist in the retail drug store. To the hospital pharmacist the most important part of his work is service, while the pharmacist in a drug store is more interested in sales. The hospital pharmacist must keep in close touch with the advances in professional pharmacy and be acquainted with new remedies as they come into use as well as with pharmaceutical progress in general. He must always stand ready to coöperate efficiently with the medical staff of the hospital, and he must be able to suggest officially recognized and tested medicines as against more expensive proprietary or branded products. This necessitates having at hand the most complete information available, in such standards as the United States Pharmacopœia, the National Formulary and New and Nonofficial Remedies."

A coöperative interest in this important subject by pharmacists and physicians will be helpful and a service will be rendered both groups and those who are served by them.

MEDICAL CENTERS.

A GREAT work is being accomplished by the establishment of Medical Centers, but little is said about the part that pharmacy has or will have in these promotions. It would seem that there are outstanding opportunities for pharmacy in these devolopments, but it is necessary that its importance be stressed as a factor in medical practice and advancement. Of course there will be hospitals and laboratories and there will be pharmacies, but the latter should enlist pharmacists of ability, who have a purpose to contribute to pharmaceutical advancement, by cooperating with physicians and surgeons in the larger service expressed by these great medical centers. The comment has been prompted by the developments in New York City where a new medical center of impressive proportions is taking shape. The dominating building of the group has twenty-six stories. The first eleven floors of the central building will be a complete general hospital, housing all the general wards; the twelfth to the seventeenth floors will be for private patients, and so the description could be continued, but the comment is for expressing the hope that an interest will develop which will give pharmacists opportunities which have never been possible heretofore.

THE HOUSE PASSES THE CAPPER-KELLY BILL.

THE House, after long debate, passed the Capper-Kelly Bill, on January 30th. Further mention will be made in another section of this issue of the JOURNAL. This comment is for expressing appreciation of the continued and persistent efforts of Congressman Kelly. If the bill becomes law, giving the right to manufacturers and retailers to protect themselves against predatory price-cutting, a great good will have been accomplished and thanks will be due the authors. In concluding his remarks on December 3rd, Congressman Kelly said:

"You may talk about the propaganda that has been coming into Congress on this measure. Have we come to the time when Americans who find themselves crucified by unjust decisions shall not come to Congress and ask for relief?" Mr. Brandeis in 1915 said, you must educate the public and Congress on this vital business question. "That is what we are trying to do. I have tried in every way to turn the light on this problem. I sincerely believe that the passage of this bill will benefit every consumer in America. It will also be beneficial to a million and a half retailers who find themselves in danger of extinction at the hands of chain-store organizations. It will be of benefit to many manufacturers who desire to protect their names and good will. It is in line with the American system of equal opportunity and the square deal. It is legislation which, if put on the statute books, will bring more relief to honest business than anything we can enact in this session of Congress."

THE WORK OF THE RED CROSS.

"I AM WILLING," said General Pershing, "to trust the Red Cross in any emergency, anywhere, at any time," the *New York Times* of February 1st comments. "But that trust is based on a confidence that the American people, whose agency it is, will provide it with funds to meet any emergency. One-half of the amount asked in the present appeal for the sufferers from the drought has been contributed. It is a gratifying response. But whatever else is done in the coming week, the other half ($5,000,000 more) should be in hand or in certain prospect. There is no question as to the need, nor can there be doubt that this organization is the best able to cope with it. At least the amount estimated to be necessary to carry on and through to the end of the need should be promptly assured. The American Red Cross is already doing its part. It awaits the full response of the American people to complete the work of mercy and relief to which it has put its kind and efficient hand."

The fiftieth anniversary of the organization of the American Red Cross falls on May 21st; on that day the chapters throughout the United States will be asked to organize celebrations with a Red Cross program.

On May 12, 1820, in Florence, Italy, Florence Nightingale, was born. It has long been claimed that the work of Miss Nightingale in the Crimea crystallized the Red Cross idea in the mind of Jean Henri Dunant.

Jean Henri Dunant was born at Geneva, May 8, 1828. While visiting the battle-field of Solferino, in 1859, he observed the want of an adequate ambulance corps, and thereafter applied himself to urging measures for the relief of the wounded in time of war. His efforts, sustained by his countrymen, resulted in the Geneva Convention in 1864 and the founding of the Red Cross Society. Having devoted his whole fortune to the cause, he was obliged to support himself by teaching, but received a pension from the Empress of Russia. In 1901 he was awarded the Nobel prize for services in the cause of peace. His "Souvenir de Solferino" (1862) made a deep impression on the public. He published also "Fraternité et charité internationale en temps de guerre" (1864), and other works.

FIRST AID WEEK—MARCH 15TH–21ST.

Prepare for the opportunities of First Aid Week—if you have not secured the posters for your display see your wholesaler. Reference to the foregoing is made in another section of this issue of the JOURNAL. The professional service side of pharmacy should be stressed while educating the public with the importance of having supplies in the house for First Aid needs. Acquaint yourself with what should be in the Family Medicine Chest, in the Auto-kit, for trips away from home, etc., so that you may suggest such needs, without unnecessarily detaining the patrons.

THE MIAMI MEETING.

PRELIMINARY NOTICE FROM THE COMMITTEE ON TRANSPORTATION.

BY T. J. BRADLEY, CHAIRMAN.

The following information about transportation arrangements to the Miami meeting is disseminated at this time, to aid members in making their plans to attend the meeting. The principal approaches to Miami are *via* (1) the Atlantic Coast Line Railroad, (2) the Seaboard Air Line Railway and (3) various steamship lines from ports on the Atlantic and Gulf coasts, including the Clyde Line and the Merchants and Miners Line. Up to the present, no concession on fares has been announced by the steamship lines, but there is a possibility that reduced rates will be offered later.

The Southeastern Passenger Association, including both lines to Miami, sell excursion tickets to Florida points at intervals of about two weeks, during the summer, and the rates are very low on these tickets, amounting to but slightly more than one fare for the round trip from many points, but they are restricted in ways that will not suit some members who wish to attend the meetings of the ASSOCIATION and some of its subsidiary organizations. The most difficult of these restrictions is the requirement that the going journey must begin at points in the Southeastern Traffic Association territory and some specified outside points on a certain day, though the return journey can be completed to the starting point at any time within about a month. Strong efforts were made to secure the privilege of beginning the journey at any time within a week before the Convention, but they were unsuccessful, and all we could accomplish was to have the beginning date for one of the excursions set at a time that would suit as many members as possible. This date is Saturday, July 25th, and members who can arrange to leave New York, Philadelphia, Baltimore, Washington, Chicago, Cincinnati, St. Louis or stations south and east of these cities on that date can secure a substantial reduction in fares for the round trips. For instance, the single fare from New York to Miami is $49.72 and the special excursion fare will be about $58.77. Similarly, the special excursion fares from other important points will be about as follows: Philadelphia, $53.58; Baltimore, $48.05; Washington, $45.74; Richmond, $41.12; Chicago, $57.35; Cincinnati, $46.96; and St. Louis, $51.23. Special excursion tickets will be sold at many other stations at corresponding reductions. When the time approaches members should inquire about these special excursion fares of the ticket agents in their home towns or in the nearest large cities.

Tickets will be good on nearly all trains, and in Pullman cars on payment of Pullman charges. Stop-overs will be allowed within the time limit of about one month and the routes going and returning through Florida and some other southeastern states may be varied within the railroad systems used.

Members coming from distant states in the West and Northwest should inquire of their railroad ticket agents about other special excursion rates that are offered to various eastern points during the summer. If none is available that will serve, ticket should be bought to Chicago, St. Louis or New Orleans and the journey timed to pass through one of these cities on July 25th, when the special excursion ticket can be bought, if it is not sold at the home station.—Further information later.

SCIENTIFIC SECTION

PHYSICS IN PHARMACY.*

PART III.[1]

BY JOHN URI LLOYD, WOLFGANG OSTWALD AND WALTER HALLER.

ON UNUSUAL DROPS AND BUBBLES.

With the pharmacist, "a drop" has probably more significance than with any other devotee to applied Natural Science. It is an accepted fact that the delicate nature of the living organism on one hand, and the potency of many pharmaceutical preparations on the other, require quantitative treatment not only in pharmaceutical theory, but also in the practice of pharmacy. A pharmacist who fails to measure and to weigh, would be a *contradictio in adjecto*, an impossibility. "A drop" is the smallest *practical unit* of *volumetric measurement* of any liquid preparation. Compared with the unit of the gravimetric method the grain, or gram, "a drop" offers the unusual advantage of being most easily reproduced experimentally.

When pharmaceutical preparations are to be subdivided by weight, comparisons must be made with standard weights, and the quantities must be weighed off in the laboratory before being used. A volumetric subdivision in the form of drops, however, may be performed anew at any moment without requiring, at least in first approximation, a standard drop for comparison. "A drop" is the quantitative unit measure for characterizing and dispensing liquid pharmaceutical preparations of strong potency, a unit easily accessible, the most easily reproducible and in practical pharmacy the most frequently used.

We said above that the drop-volume unit is an *approximate* volumetric unit of measurement. In fact every pharmacist has noted the difference in the size of drops, *e. g.*, of aqueous, alcoholic and ether solutions, decreasing in the order stated. But even in aqueous solutions of different kinds there may be differences in the size of drops produced from the same dropping bottle or dropping tube. For example a sugar solution produces a larger drop than a solution containing small quantities of peptones, or soaps. The speed of the formation of drops may also sometimes influence their size; if, *e. g.*, a peptone solution is made to drop as slowly as possible, the drops will be larger than when drop formation is fast, etc.

It is now known that the forces of *surface tension* are responsible for these differences in the size of drops. Different solutions may not have the same surface tension, therefore may yield drops of different size. A systematic study of these differences among pharmaceutical preparations used in the form of drops seemed to be of interest.

In the formation of an ordinary drop, *e. g.*, from a dropping bottle, evidently *three* interfaces are involved: The interface between liquid and surrounding air or the vapor of the liquid itself, the interface between glass and liquid, and finally that between glass and air, as is shown in Fig. 1.

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* Scientific Section, A. PH. A., Baltimore meeting, 1930.

[1] Translated from the German by Dr. Sigmund Waldbott.

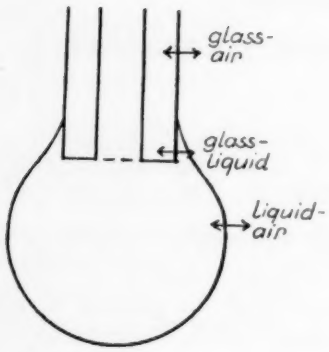


Fig. 1.

Drops of this kind have received detailed theoretical consideration in textbooks on Physics.

The thoughtful and observant pharmacist, however, is confronted in his laboratory with liquid drops of quite another kind and another origin, concerning which nothing is found even in modern textbooks on Physics. The present paper describes such "*unusual drops*" observed by the senior author many years ago, and an endeavor is made to give an explanation of their mode of formation and characteristics. A supplementary chapter will deal with an "*unusual bubble*," a phenomenon which also requires for explanation the forces prevailing at interfaces.

All the older hitherto unpublished experiments of the senior author dating back several decades, were repeated by the junior authors, with various improvements of method. The fact developed that the greater part of the descriptions of phenomena completely agreed with the results obtained recently; thus the present paper contains pages which although written about 50 years ago, fully hold good to-day. Likewise most of the older drawings were completely verified by the recent investigation. Their number was increased by addition of photographs of phenomena of outstanding interest and importance.

Essentially new are, perhaps, the theoretical discussions at the conclusion of the paper, which develop more in detail the theory only lightly indicated by the senior author.

I. DROPS AT THE INTERFACE LIQUID-LIQUID.

Experiment.—Into a cylinder pour a little water and benzol. Mix them together by strong agitation, and as they separate it will be seen that the meniscus takes a curved line (Fig. 2). By observing the small globules of benzol as they rise from beneath this curved line, it will be seen that when the center ones strike

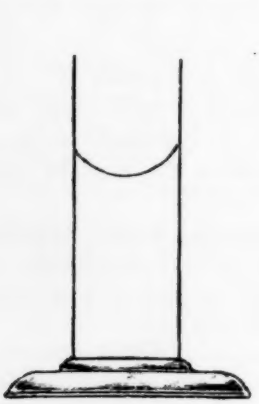


Fig. 2.

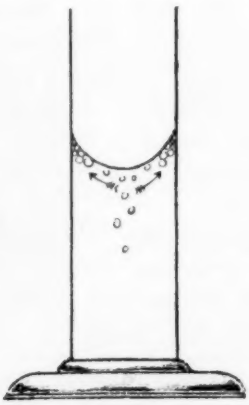


Fig. 3.

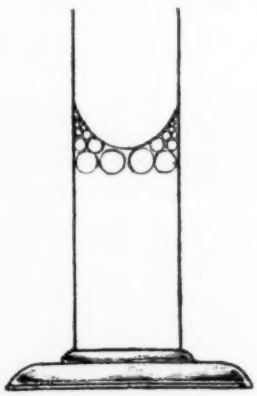


Fig. 4.

the convex surface of the curve in their upward course, they diverge and move towards the glass, pressing upward against the under side of the dividing segment (Fig. 3).

Observe them closely when they strike the glass as they enter the wedge and it will be seen that they force themselves into the tapering triangle. The smaller globules squeezing highest, pass through the successively larger ones beneath them, as shown by Fig. 4.

After a time the large globules, by their great pressure, will burst the films that separate the liquids, escape into and coalesce with the benzol above; but the smaller ones have not the power to do this. They form a fringe next the glass beneath the films that separate the solutions, being thus held prisoners in the capillary wedge.

II. THE WETTING DROP.

Experiments.—Pour a liquid (excepting mercury under air) into a clean, cylindrical glass vessel and the surface presents the appearance of a plane that curves up toward the glass just before contact therewith. Decrease the diameter of the vessel to that of a glass tube and the surface becomes concave.[1] This rule holds good for all liquids of the present series when the surface is exposed to the air. Under other conditions, such as different surface contact, and different materials for containers, however, the reverse may occur, shown as follows: Pour a little chloroform into a tube of about $^1/_3$ inch in diameter, it assumes the condition previously described. Add now to the glass at just above the surface line, a small drop of water. The water, instead of floating as its gravity would indicate, forces itself about half its bulk below the chloroform, separating the chloroform from the glass. Creeping now downward, the globule of water assumes a wedge shape, as shown by Fig. 5, also by Fig. 6A, raising the overlying chloroform meniscus. Continue adding the water drop by drop, allowing it to flow down the side of the tube and into the preceding water globule.

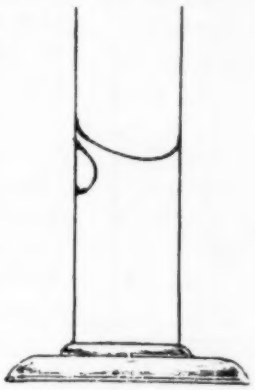


Fig. 5.

The wedge raises the surface of the chloroform above itself, encircling, as it does so, the side of the tube. (Fig. 6B.) After a time, as water is slowly added, the chloroform presents an appearance like Fig. 6C. A narrow section of chloroform on the side of the tube opposite the water globule only remains to unite the chloroform film above with the chloroform below. (Fig. 6D.) Finally as more water is added, this bond gives way, the water stratum perfects itself, producing a diaphragm across the tube, suddenly uniting in a layer, whereby a globule of chloroform is excised and rests in the cup formed by the surface of the water, while the bisecting water in turn rests on the chloroform below. (Fig. 6E.) If the water is added to the surface at different parts of the glass, just touching the chloroform, the water at the surface line of the chloroform gradually, as water is slowly added,

[1] Compare Part II of this series, JOUR. A. PH. A., 18 (1929), 867, Figs. 13, 14, 15 or Figs. 16, 17 and 18.

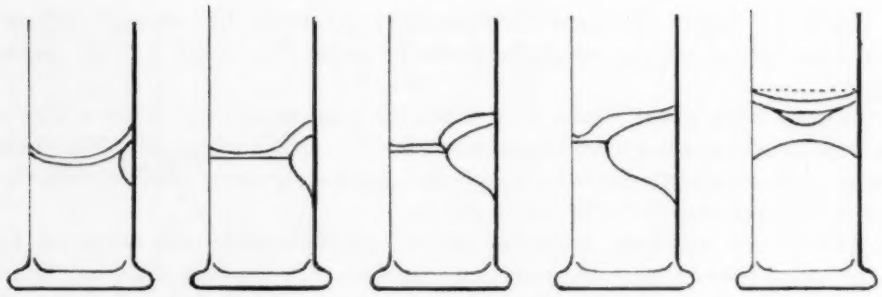


Fig. 6.

creeps around the glass, the chloroform finally assuming an hour-glass form, as shown in Fig. 7.

Finally, the central outreaches of the ringlet of water unite, excising a drop of chloroform which rests in the cup above the water. (Fig. 6E.) The chloroform below the water cap has assumed a surface the reverse of the contour presented when it was exposed to the air. It is now convex instead of concave. (Fig. 8.)

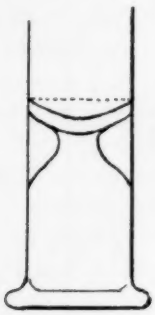


Fig. 7.

The principle involved may be even more forcefully illustrated with carbon disulphide and glycerin. By this experiment (Fig. 6, A to E and Plate I, A to E), we behold the growth of the convex surface that forms between such liquids and water when they are in contact with each other. It matters little how violently they are mixed, or which is added to the other, on resting, a surface drop (pendant drop) always springs into existence.

III. THE PENDANT DROP.

Experiment.—If into a cylinder containing water a little chloroform be allowed to trickle, drop by drop, down the inner surface of the glass, when it strikes the water, although much heavier it at once separates from the

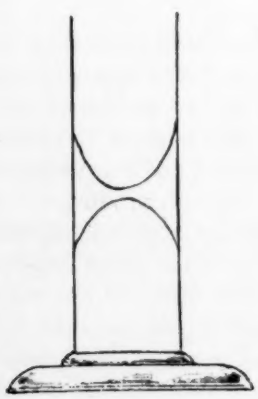


Fig. 8.

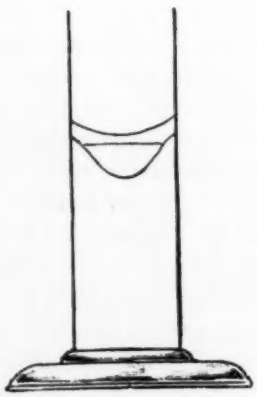


Fig. 9.

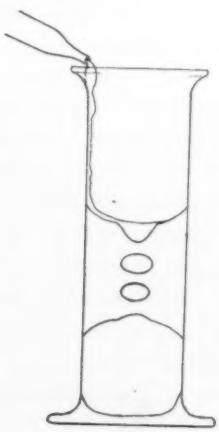
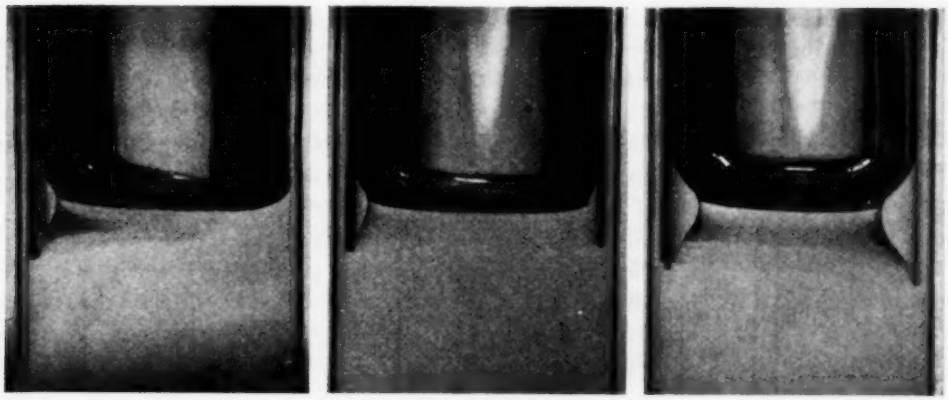
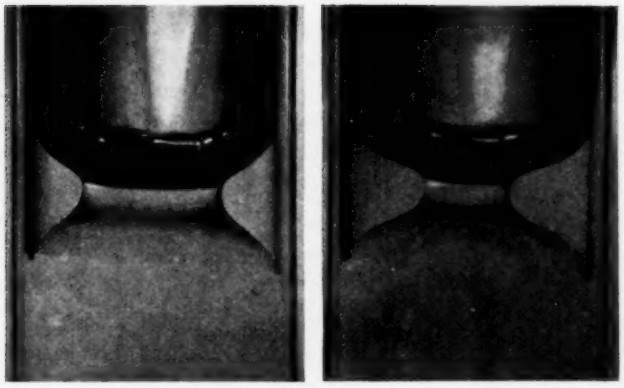


Fig. 10.



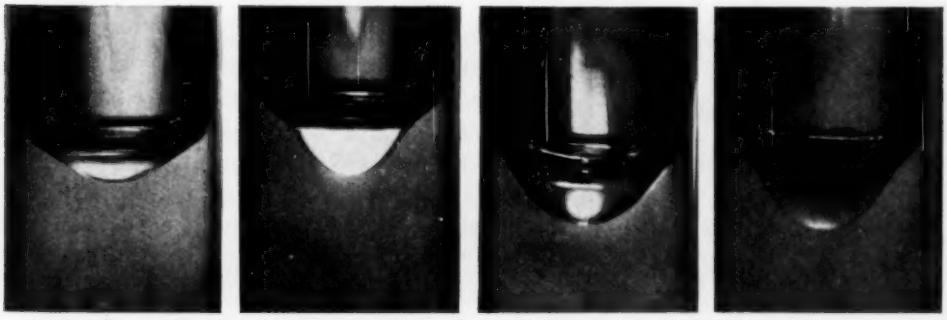
A. B. C.



D. E.

Plate I.

glass and spreads over the surface of the water as a film. Continue adding the chloroform, and the surface floats to the center of the film, coalescing into a globule which rests pendant (Fig. 9) until it becomes heavy enough to overcome the attraction of cohesion of the surface film of the under liquid, when a portion (more than half the drop) breaks from the globule and falls to the bottom. By slowly adding the chloroform at the edge, it is seen to flow regularly to the center of the cup and drop below in fragments (Fig. 10).



A. B. C. D.

Plate II.

This phenomenon so easily produced, seems to have very seldom attracted the attention of scientific authorities.[1] By referring to the preceding pages, "the wetting drop," the reader will meet an attempt to illustrate the manner in which convex surfaces of one class of heavy liquids are produced when water is poured upon them. It will be observed by referring to Fig. 6E of that series that a globule of heavy liquid invariably rides on the surface of the water, as is true of all liquids showing the "wetting drop" phenomenon. Thus, a mixture of carbon disulphide with either glycerin or water, or wintergreen oil with either glycerin or water, or chloroform with either glycerin or water, will produce such surface globules. (See A to E, Fig. 6.) These drops hang pendant if the container be narrow, or if large, float as an inverted cone on and near the center of the lighter liquid. (Plate II, A to D.)

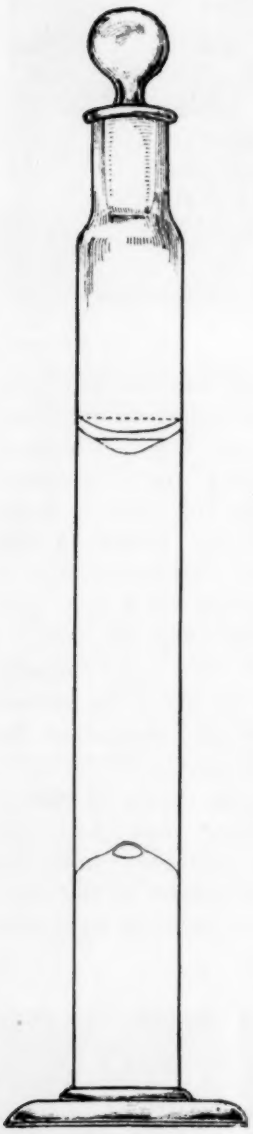


Fig. 11.

Such globules are not sports, for they obey a natural law, and it is immaterial, as before stated, whether a heavier liquid of this description be poured upon the lighter one, or the reverse, or whether the two liquids are thoroughly incorporated by agitation and then permitted to separate. The phenomenon of the hanging surface drop follows invariably. Indeed, we have failed in every endeavor (at ordinary temperature) to separate the drop from the surface when equal amounts of glycerin and carbon disulphide are mixed under conditions mentioned herein, although with such mobile liquids as chloroform and water, a sudden jar will detach most of it, but never completely.

IV. THE PENDANT BUBBLE.

Experiments.—Pour into a cylinder a stratum of carbon disulphide and then carefully fill the cylinder nearly to the stopper with water, leaving a narrow stratum of air beneath the stopper. Now quickly invert the cylinder and return it at once to the natural upright position, when it will be seen that a part of the air will be excised by the carbon disulphide and held a prisoner. The bubble of air varies in size but seldom will it escape entirely. On jarring the tube it is seen that the bubble is retained with great persistence, and

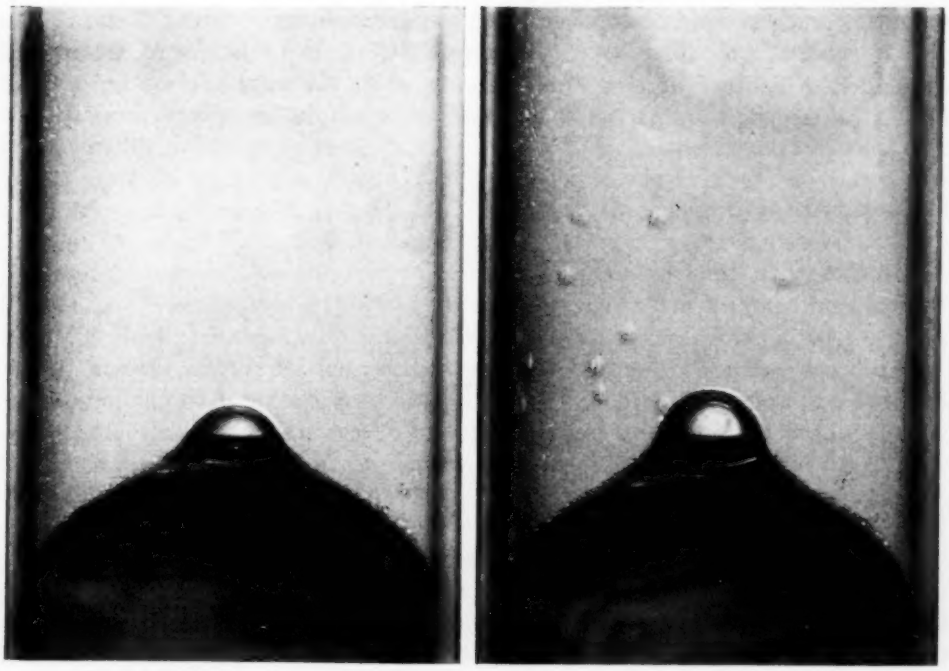
Fig. 12.

[1] The demonstration of a pendant drop (with creosote and water) has been made by Ch. Tomlinson, *Experimental Essays*, London, 1863.

The name pendant drop for a hanging drop in general, has been used by A. M. Worthington, *Phil. Mag.* (5), 19, 46–48 (1885); cf. *References to Capillarity* by S. Waldbott, being Chapter VII of *A Study in Pharmacy*, by J. U. Lloyd (1900); No. 268 (Tomlinson), No. 473 (Worthington).

if it be less than one-tenth of the diameter of the cylinder figured herein, cannot be detached by violence, even by striking the bottom of the tube in the palm of the hand. (Fig. 11 and Plate III, A and B.) The same phenomenon can be even better illustrated by using a flat-sided bottle, as it is easier to study the nature of the surrounding mediums through a parallel surface than through a cylinder. (Fig. 12.)

Moving over its surface are often to be seen multitudes of tiny globules apparently resting on a film that differs from the underlying stratum, and which is connected with the surface film of the adjacent carbon disulphide, which in turn reaches to the glass container. (Fig. 13.) On closer inspection it is seen that the



A. B.

Plate III.

mediums about this bubble are in a state of physical activity, and that constant changes are taking place in and about films in this vicinity. The stratum of water above the dividing films may become (on decreasing the temperature) filled with microscopical globules of carbondisulphide which, falling upon the bubble, move freely over its surface to the edge of the film of carbondisulphide. They maintain their individualities on the upper film's contour, not underneath it. (Fig. 14)

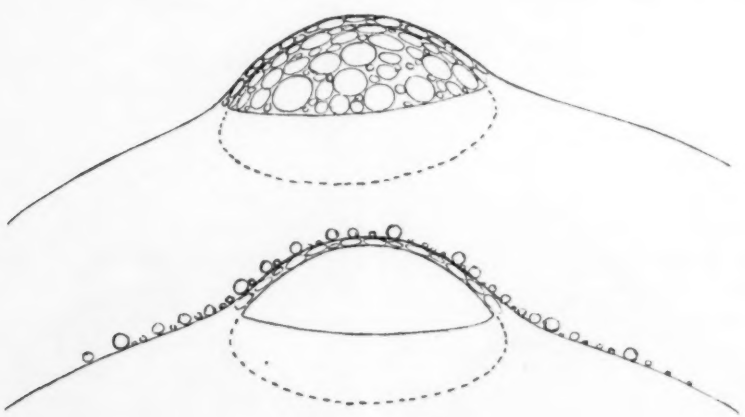
V. THEORY OF THE PHENOMENA.

A. General Formulation of the Theory.

The phenomena before described are not the haphazard products of accident, which many investigators probably have thought them to be. The close

study of the subject, however, has shown that these peculiarities of the interfaces manifest themselves with exceeding *regularity* and are quite specifically dependent on the nature of the liquids. We have noted before that the phenomenon of the "pendant drop" with certain pairs of liquids is always realized, regardless of the manner in which the liquids are brought together, while with some other pairs of liquids this phenomenon was never observable. Without doubt, these phenomena are based on exact laws which are closely connected with the nature of the liquids, and are of especial interest theoretically. We may justly suppose that capillarity of the liquids is the primary determining factor, supplemented perhaps by other physical properties. Selecting the accepted theory of capillarity as the basis of our discussions, we will now endeavor to deduce from this theory some fundamental conditions governing drops and bubbles at interface surfaces.

1. Drops at the Interface Liquid-Liquid.—A drop of liquid A can remain suspended in another, foreign liquid B only when the specific gravities of both liquids are equal. Ordinarily, this condition is not fulfilled; the drop will be



Figs. 13 and 14.

pulled upward or downward by gravitation until it strikes the upper or lower boundary of the liquid. This boundary may be formed either by the air above the liquid surface, or by the bottom of the vessel, or by a layer of liquid A, which is situated above or below B, depending on conditions of density.

When the drop moves toward the boundary layer between A and B, it hydrodynamically pushes before it a coating layer of liquid B, which causes the interface surface somewhat to be arched at its summit, increasing its tension. Thus the first effect of the interface tension is to arrest the drop.

While the drop and layer A are at first separated by a film of substance B, this film gradually becomes thinner, finally is torn at one spot and pulled entirely to one side through the action of surface tension; as a result, the drop merges with layer A. In thus coalescing, surface energy is set free, since the surface of the drop disappears in the liquid mass, and because in addition the tension of the boundary surface has a positive value. (Regarding the possibility of a negative interface tension see Wo. Ostwald, *Grundriss der Kolloidchemie*, 7th ed. (1926), 80.)

Therefore the positive interface tension must be regarded as the driving

force in the merging of drops and liquid layers. A further condition of the process of coalescence, however, is the formation of a slight defect in the film at some spot thereof. As long as the interfaces liquid-liquid are complete within themselves and are of uniform tension throughout, the interface tension alone cannot tear the film.

What is the cause of the first tearing of the film? In the first place, no doubt, it is gravitation of the drop which causes liquid to be squeezed out of the space between drop and layer. The compressing force is equal to buoyancy, therefore proportional to the volume of the drop (thus proportional to the third power of the radius or the diameter), and the difference in density of the liquids. Evidently then, the "tearing" pressure becomes rapidly greater with increasing diameter of the drop, since for example in doubling the diameter, the compressing force becomes eight times as great. For this reason, large drops coalesce faster and more easily than do small drops.

Neither gravitation nor interface tension, however, explain the surprisingly great stability of drops in some pairs of liquids. It is true, a certain resistance of the drops to merging is noticeable with all liquids, especially with those that easily form emulsions with each other. Stability of emulsions cannot be explained through the usual notions on interface forces, because under this theory a very small pressure should be sufficient to pierce the separating film. Thus we are led to the assumption that in very thin films the tension is after all something different from the normal interface tension between larger masses of liquids; we must assume an especial *film tension*, as the senior author has done many years ago.

Discussing such a tension theoretically: The interface tension is a function of the potential difference between molecules in the interfaces and the interior of the liquid. The molecules at the surface have in general (not always) the greater potential, because their cohesion valences are less saturated than are those in the interior of the liquid. Now it is certain that in the surface of a film which is thinner than the radius of action of the cohesive forces the molecules are still more "exposed" and must have a much greater potential than in a "massy" surface. The same is the case with the molecules situated "within" the film. Therefore with very thin films the potential differences between inner and outer molecules are entirely different from those with liquids in bulk, which recalls the increase of vapor pressure in such layers, and the ready transition of such a thin film into the gaseous state. Owing to the more "exposed" position of the molecules in the film, the potential difference, and with it the interface tension will generally be greater than in the case with the liquid in bulk.

The thinner the film becomes, the greater the interface tension or preferably speaking, the "film tension" may become. Thus with the approach of the drop to the interface liquid-liquid the interface energy increases. The consequence is a *repelling force*, which when it exceeds that of gravitation, prevents the coalescence of drop and layer.

It may be shown that orientated interface layers such as electrical double layers, dipole clouds, layers of coupling substances, etc., whose stabilizing effect upon disperse systems is well known, cause an especially strong increase of the interface tension upon the thinning of the film. This theory of variable film tension, therefore, includes all other explanations heretofore given for the stability

of disperse system. The theoretical and practical importance of these systems which exhibit such particular interface properties, in addition to the theoretical reasons discussed, justify us in differentiating "film tensions" from the normal "interface tensions."

2. Drops at the Interface Liquid-Gas.—(a) The pendant drop. A drop of liquid A surrounded by a heavier liquid B, in rising strikes the meniscus of the liquid, the liquid-gaseous interface B-air. In the same manner as with a liquid-liquid interface, the film tension at first retards the drop. When its buoyancy is sufficiently great, it breaks through the film and in the next instant is stretched on account of the action of the different interface tensions. The shape of the resulting lens depends on the relation of the tensions involved. The tensions are in equilibrium when the following relation exists: (Fig. 15.)

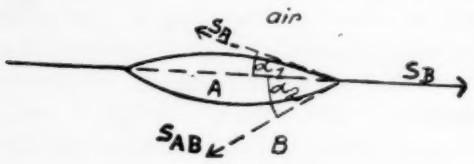


Fig. 15.

$$S_B = S_A \cos \alpha_1 + S_{AB} \cos \alpha_2.$$

This equation shows that when $S_B = S_A + S_{AB}$, the angles α_1 and α_2 are equal to zero and the lens is entirely flat; when S_B becomes slightly greater, the drop will spread in the form of a film all over the available surface.

In the characteristic phenomenon of the "pendant drop" we are evidently confronted with the case where S_B is smaller than the sum of S_A and S_{AB}.

The pendant drop forms only when the surface of A does not spread, but also only when it does not contract. If the surface tension of A is very great, the free surface of A seeks to become smaller, which causes the circle of intersection between the drop and the surface of B to be more and more contracted (Fig. 16). This diminishing circular circumference is capable of carrying only a small weight; as a result, more and more of the drop will fall off. However, as long as the relation of interface tensions is such as to prevent *complete* contraction of the free surface of A, a drop however small, will always remain suspended from the surface of B.

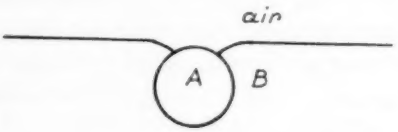


Fig. 16.

The shape of this drop like that of all hanging drops, is characterized by the equation already given. When the contractile tension S_A becomes very large, cos α_2 must become smaller and smaller, approaching the limiting value —1; it follows from the vector nature of these quantities that cos α_1 then approaches the limiting value +1. The equation for the tension in the extreme case is

$$S_B = S_A - S_{AB}.$$

When these critical values are exceeded, the film of B closes over the drop, and no pendant drop can be formed.

We are now in a position to formulate mathematically two conditions for the formation of the pendant drop:

(1) The drop must not spread:

$$S_B < S_A + S_{AB}.$$

(2) The drop must not contract:

$$S_B > S_A - S_{AB}.$$

These are two conditions which may be predicted theoretically from the interaction of the three interfaces between A, B and air.

In the usual experiments with suspended drops in narrow glass cylinders, however, additional interfaces come into play, namely, those of Glass-A, Glass-B and Glass-Air. What is their influence upon the pendant drop?

The interface tension of liquids toward glass is nearly always negative (mercury excepted), *i. e.*, the surface of contact tends to become larger. As a consequence, the liquid-air surface is always pulled up high and is under tension; in other words, the liquid *wets* the glass.

The "*wetting tension*" of different liquids is of different magnitude. The better-wetting liquid displaces another not wetting so well and pushes itself forward along the glass wall, carrying the edge of the liquid-liquid interface with it. Since the center of the liquid-liquid interface must lag behind, it naturally follows that the *meniscus must always be convex toward the side of the better-wetting liquid.* It is entirely immaterial whether the better-wetting liquid is heavier or lighter than the other. If it is below the other, the meniscus will be convex below, if above, the meniscus will be convex above.

For the pendant drop, the form of the meniscus is of fundamental importance. We will pour into a glass cylinder a light liquid and upon it carefully, a heavier one in order to note under what conditions a pendant drop may form. When the heavier liquid has a smaller wetting tension than the liquid below it, the meniscus between the two will be convex toward the bottom. The better-wetting liquid pushes upward along the wall, displacing the other liquid from the wall, causing the greater part of the latter liquid since it is heavier, to fall to the bottom through the center of the meniscus. A small remainder gathers in the cavity of the meniscus and there forms the "pendant drop," provided that the tensions S_B, S_A and S_{AB} fulfill the conditions 1 and 2 before explained.

But if the heavier liquid is at the same time the better-wetting one, a meniscus convex above is formed upon carefully producing the layers as before. Then the heavy liquid pushes its way downward along the wall, gradually flowing beneath the lighter liquid. Just as long as some of the heavier, well-wetting liquid is yet on top, the meniscus remains convex upward.

All of the heavy liquid runs off along the wall, and no pendant drop can form in the center of the meniscus. The meniscus will become convex below only at the moment when the surface is entirely cleared; in this case no substance is left to form a pendant drop. Thus, a pendant drop can never be formed when the wetting tension of the heavier liquid is greater than that of the light liquid, even though conditions 1 and 2 may be fulfilled. Therefore the *third* condition for the formation of a pendant drop may be formulated as follows:

(3) $$S_{A-Glass} < S_{B-Glass}.$$

We shall see further on that these three conditions derived theoretically agree in all cases with the experimental observations on pendant drops.

(*b*) *The wetting drop.* The influence of wetting tension between glass and liquids is especially noticeable with drops which adhere directly at the glass wall of the vessel. If we pour a light and well-wetting liquid upon a heavier, poorly-wetting one, the phenomenon of the wetting drop may be observed as recorded before. The well-wetting liquid displaces the other from the glass wall and pushes its way downward although it is less heavy and could float upon the surface of the other. The cause of this phenomenon is the pulling downward of the interface surface by the wetting tension, tending to form a meniscus convex above. However this meniscus can attain its complete form only if the quantity of the upper liquid is large enough to cover it. As long as there is only a small quantity of liquid present, a pendant drop is formed at the glass wall (*the wetting drop*) which leaves the center of the meniscus free. In this manner the peculiar form of the interface of the wetting drop originates, composed of convex and concave menisci.

The physical conditions for the formation of the wetting drop are theoretically the following:

(1) Liquid B of the wetting drop as we have seen must wet better than liquid A beneath it. For the wetting tensions, therefore, the relation must hold:

$$S_{A-\text{Glass}} < S_{B-\text{Glass}}.$$

Fig. 17.

(2) If the remaining free surface of A were contractile, the ring-like wetting drop B would become a skin uniformly covering liquid A. Consequently formation of the wetting drop is possible only if the surface tension of A is smaller than the sum of the tensions S_B and S_{AB} which act in opposite direction (Fig. 17). Thus the 2nd condition governing formation of the wetting drop is

$$S_A < S_B + S_{AB} \quad \text{or} \quad S_B > S_A - S_{AB}.$$

(3) The hour-glass form of the meniscus in the wetting drop is caused by the tension of the free surface of A pulling the other interfaces toward the center, forming a constriction. Now if the free surface of B contracted, the free surface of A would have to spread to the edge and could no longer maintain the tension of the ring of B. Liquid B would then fall apart into small droplets, or would spread flatly along the wall of the vessel. Therefore the wetting drop in its typical form can be generated only if the surface of B does *not* contract, thus when

$$S_B < S_A + S_{AB}.$$

Comparing the conditions deduced with those holding good for the pendant drop, we find that they are the same. In fact liquids which satisfy these conditions, invariably show both phenomena, the wetting drop as well as the pendant drop.

3. Bubbles at the Interface Liquid-Liquid.—The problem of bubbles at liquid-liquid interfaces is entirely similar to the problem of drops.

Assuming a bubble of air or vapor to rise in liquid A, striking the liquid-liquid interface between A and another liquid B. As in the case of the rising drop, the bubble pushes before it a coat of liquid A which at first rests as a thin film between the bubble and the interface. In this case, also, the tension of the film will prevent the further rising of the bubble unless buoyancy is strong enough to cause the interfaces to be torn.

It is true that here it is difficult to decide whether the bubble is held back by a peculiar film tension or by the normal interface tension. If for example the film did not possess any particular firmness, buoyancy would readily pierce it, it is true, but the bubble would nevertheless remain suspended in the interface. This is because if the volume of the bubble were to intersect the interface, three different interfaces would meet, readily adjusting themselves in an equilibrium of tension. To this, buoyancy adds a strong vector acting perpendicularly upward; as a result the all-supporting liquid-liquid interface is stretched in upward direction (Fig. 18). We note that the bubble is held by the interface surface; it is true not through film tension but through the interface tension.

B. Quantitative Comparison between Theory and Experiment.

We shall now examine whether these general theoretical notions concerning drops and bubbles at interface surfaces actually correspond with experimental observations; first whether those tensions which permit of being calculated from the experiments are actually equal to the normal surface tensions of theory, qualitatively and quantitatively, selecting for examination a few quite special cases. In a subsequent paper we intend to take up more in detail the especially important problem of wetting tensions, experimentally as well as theoretically.

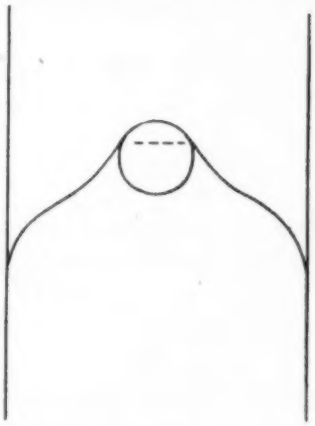


Fig. 18.

(*1*) *The Pendant Drop.*—The tensions holding the pendant drop in suspension, may be calculated by different methods.

(*a*) *From the weight of the pendant drop:* (cf. Plate II). The interface between the drop and liquid B tends to be curved convex downward on account of the weight of the hanging drop. The strongest downward pull is exerted upon the meniscus line at the edge of the drop, because along this line the total weight of the drop must be carried by the interface. The meniscus line at the edge becomes the steeper the greater the weight of the drop and the smaller the carrying interface tension.

If α is the deviation of the meniscus line from the horizontal, then the force of the interface tension S_{AB} pulling upward at the edge of the meniscus is

$$K = 2\,\pi r \,.\, S_{AB} \,.\, \sin\alpha.$$

This force must be equal to the weight G of the hanging drop, therefore

$$2\pi r \,.\, S_{AB} \,.\, \sin\alpha = G \text{ and}$$

$$S_{AB} = \frac{G}{2\pi r \,.\, \sin\alpha}$$

G is equal to the product of the drop volume v and the difference of densities $d_A - d_B$ of the two liquids. The volume of the drop is best obtained from the enlarged photograph of the drop by measuring the meridional area and applying Guldin's rule.

For the pendant drop chloroform-water illustrated in Plate II-B, the following result was obtained:

$V = 0.166$ cc. $\quad G = 0.081$ g.
$r = 0.518$ cm. $\quad \sin \alpha = 0.75$
$S_{AB} = 0.333$ g./cm. $= 32.6$ dyne/cm.

This value agrees well with that obtained by means of a different method,[1] of the interface tension between chloroform and water, namely, 33.3 dyne/cm.

(*b*) *From the curvature of the drop.* The interface tension S_{AB} may also be calculated from the curvature of the drop. The curvature becomes the more pronounced the smaller the interface tension, and the greater the hydrostatic pressure causing the drop to bulge. In the center where the curvature is strongest, the pressure is equal to the product of the entire height of the drop and the difference in densities $d_A - d_B$.

This hydrostatic pressure is exactly compensated by the curvature pressure of the interface. The magnitude of the curvature pressure may be calculated from the curvature and the interface tension, as follows (Fig. 19):

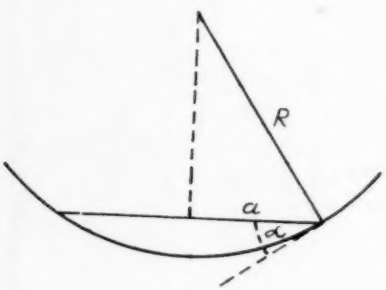


Fig. 19.

Consider a plane (horizontal) section through an evenly curved portion of the interface. The normal (vertical) component of the interface tension force attacking at the circumference of the circular section line, is

$$K = 2\pi a \,.\, S_{AB} \,.\, \sin \alpha.$$

The sectional area upon which this force acts, is

$$f = \pi a^2;$$

the curvature pressure therefore is

$$P = \frac{K}{f} = 2\, S_{AB} \,.\, \sin \alpha / a.$$

Let R be the curvature radius of the interface, then we readily obtain

$$\sin \alpha / a = 1/R \text{ and } P = 2 \,.\, S_{AB}/R.$$

This pressure is equal to the hydrostatic pressure

$$h \,.\, (d_A - d_B)$$

and we have finally

$$S_{AB} = {}^1/_2 \,.\, R \,.\, h \,.\, (d_A - d_B).$$

From the photograph of Plate II-B the following values were derived for the apex of the pendant drop:

$R = 0.28$ cm. $\quad h = 0.45$ cm., and from this
$S_{AB} = 30.2$ dyne/cm.

Correspondingly, the hanging drop in Plate II-A gave

$R = 0.51$ cm. $\quad h = 0.26$ cm., therefore
$S_{AB} = 31.7$ dyne/cm.

[1] Reynolds, *J. Chem. Soc.*, 119 (1920), 460.

Both values are in sufficient agreement with the magnitude of the surface tension between chloroform and water, = 33.3 dyne/cm. (Reynolds: see foregoing.)

(2) *The Pendant Bubble.*—We have concluded above that the tension retaining a bubble at the interface of two liquids, is in any case the tension of the interface liquid-liquid, regardless of whether there rests a film upon the bubble or not. We will verify this theoretical conclusion by endeavoring to calculate the magnitude of the tension from the experimental data.

The bubble causes the interface to be arched until the vertical component of the interface tension exactly compensates the buoyancy of the bubble. If the force of buoyancy is K_A, the relation must exist: $K_A = 2\pi r . S_{AB} . \sin \alpha$. As Fig. 18 shows, r must be the radius of the small circle along which the interface liquid-liquid "intersects" the bubble.

The buoyancy may be calculated from the volume of the bubble and the densities of the displaced liquids. Since the upper and lower sections of the bubble are in contact with different liquids, the density must have a value intermediate between the values d_A and d_B, obtained by dividing the density interval in inverse ratio of the partial volumes referred to.

The total volume of the bubble is calculated from its radius R, and we have:

$$K_A = V . d = 4/3\pi . R^3 . d = 2\pi r . S_{AB} . \sin \alpha$$

and from this

$$S_{AB} = \frac{2 R^3 . d}{3r . \sin \alpha}.$$

For the pendant bubble in Plate III-A (carbondisulphide-water) the following values were obtained:

$R = 0.20$ cm. $\qquad r = 0.17$ cm.
$\sin \alpha = 0.78 \qquad d = 1.2$ g./cc.
$S_{AB} = 47.5$ dyne/cm.

This value quite closely approaches that obtained by another method[1] for the interface tension between carbondisulphide and water, namely, 49.3 dyne/cm.

Thus we reach the conclusion that a quantitative comparison of the theory presented, with a few special experimental examples shows a strikingly good concordance.

SUMMARY.

I. Former investigations of the senior author on drops and bubbles at interfaces were repeated and completely verified. Peculiar phenomena of drops and bubbles are observed which very regularly appear at interfaces and are by no means haphazard products. The drop formations described here are the following:

Drops at the interface between two liquids, and drops at the surface of a foreign liquid, either in center position (the *pendant drop*) or in marginal position (the *wetting drop*).

Besides, air bubbles are described being attached at the interface between two liquids.

II. Endeavoring to explain these phenomena from the point of view of the accepted capillary theory, the following results were obtained:

[1]Reynolds, *J. Chem. Soc.*, 119 (1920), 460.

(*a*) The great resistance of small drops to coalescence with the bulk of the liquid cannot be explained by the usual interface tensions. A resistant film seems to coat the interface. Purely theoretical considerations lead to the conclusion that the tension of thin films is greater than the interface tension of the liquid in bulk. The particular properties of the film tension explain the stability of emulsions.

(*b*) The *pendant drop* can form only when the interface tensions stand in a definite relation to one another. Theory permits the derivation of three conditions for the interface tensions of the "pendant drop." The same conditions hold good also for the formation of the "wetting drop."

(*c*) In this connection the case of the "pendant bubble" is also treated theoretically, and is explained by interface tension.

III. From a few photographs of drops and bubbles the forces are calculated which are active in these formations. The results show that the tensions agree very well with the interface tensions, which confirms our theory.

RESEARCHES ON CHINESE MATERIA MEDICA.*

BY K. K. CHEN,[1] PH.D., M.D.

While numerous noteworthy discoveries for the healing of the sick have been made during recent years, medical science still owes much to the people of the past for the accumulated knowledge of many remedies and cures. Primitive medicine almost always involves empiricism and sometimes superstition, but is often based on some keen observation. Such an observation, when confirmed and well appreciated, then becomes a sound principle in modern medicine. An example of this kind can be found in the prevention of smallpox in civilized communities. It is true that Edward Jenner (1796) was the first person to introduce vaccination, but the observation that inoculation of cowpox débris confers immunity against smallpox was previously known to the Orientals and Europeans, especially among milkmaids. It was from the latter that Jenner obtained the information, then conceived the idea of vaccination as a prophylactic measure against smallpox, and finally achieved his discovery.

We can recall another example in the introduction of the foxglove or digitalis for the treatment of heart diseases. The leaves of this plant were long known to diminish the body fluids in dropsy, but it was not until 1775 that William Withering actually initiated its use in medical practice. It was an old family recipe from which Withering derived his knowledge and which led him to investigate the therapeutic value of digitalis, which has now become an indispensable drug to relieve the symptoms of cardiac disorders.

Chinese civilization, like other ancient civilizations, is rich in curative measures. Its materia medica up to 1596 included 1871 drugs. Such drugs as camphor, cinnamon (*Cinnamonium cassiæ*), anise (*Illicium verum*) and rhubarb (*Rheum officinale*), which have been known in China for centuries have been admitted to modern pharmacopœias. There are, however, many other drugs that in China

* Read before the Committee on the Promotion of Chinese Studies of the American Council of Learned Societies on Dec. 30, 1930, at Cleveland.

[1] From Lilly Research Laboratories, Indianapolis, Indiana.

were believed to have unlimited therapeutic value, but have never been subjected to careful, critical, scientific investigations. And it is such investigations that may yield fruitful results. The recent introduction of Ma Huang into Western medicine is a good illustration.

Ma Huang, or botanically *Ephedra sinica* which is an herb and grows wild on the northern and western frontiers of China, has been known in Chinese medicine since antiquity. Some fifty centuries ago, Emperor Shen Nung tested this drug and admitted it to the legendary book entitled "Pentsao." The drug is believed to produce sweating, reduce fever, stimulate the circulation and relieve cough. It is an ingredient of several famous prescriptions. For example, in the treatment of Shan Han, which is a disease known to the Chinese physicians probably corresponding to fevers resulting from typhoid infection, pneumonia or other causes, pills made from the following prescription are considered to be of high value.

Ma Huang (*Ephedra sinica*) without nodes	10 catties
Apricot Kernels (*Prunus armeniaca*) blanched	4 shêng
Rhubarb (*Rheum officinale*)	1¾ catties
Snow Water	

Detailed instructions are given for making an extract of the above crude drugs, and finally dividing the mass into pills. The efficacy of this remedy is believed to depend on the diaphoretic action of Ma Huang, assuming that perspiration is a means of reducing fever. More commonly, Ma Huang is prescribed with other crude drugs and made into a decoction, and taken by the patient as such. This was the status of Ma Huang in Chinese medicine before any scientific investigation was begun.

In 1887 a pure principle, an alkaloid, was isolated by a Japanese chemist from the crude drug, and has since been called ephedrine. Other Japanese scientists soon discovered its mydriatic action, that is, its pupil-dilating effect. But this property has a limited clinical application and the drug did not attract much attention in the medical profession at large.

During the next three and a half decades, interest in ephedrine was almost wholly limited to the determination of its chemical composition. Its structural formula was established, and its synthesis repeatedly achieved.

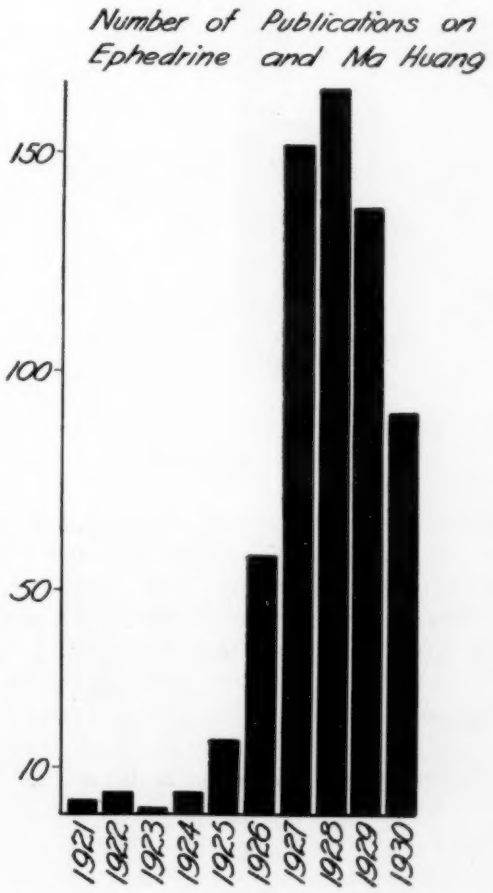


Fig. 1.

In 1923 my former colleague, Dr. Carl F. Schmidt, now at the University of Pennsylvania, and myself began to study a group of potent drugs suggested to us by a Chinese druggist. In the list Ma Huang was mentioned, and a small sample was purchased from a native drug store. We made a decoction of the drug and injected a portion of it into a narcotized dog left by a group of students after their exercise—and we at once observed a prolonged rise of blood pressure. The result of our first experiment aroused our enthusiasm and stimulated us to carry out an exhaustive investigation. Before long, we isolated an alkaloid and, as we were unaware of our predecessors' work, the nature and formula of the compound gave us considerable trouble. We almost decided to give a new name to this alkaloid, but we were cautions enough to search all the literature available in our small library in Peiping. Finally, we learned that we were dealing with a well-known chemical compound called ephedrine. Our attention was then chiefly devoted to the pharmacological action and possible therapeutic application. Thus we ob-

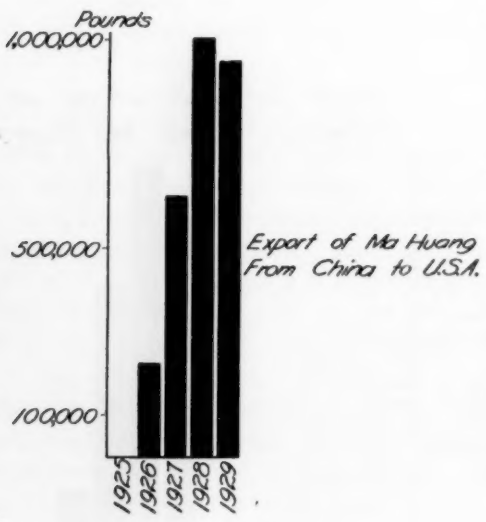


Fig. 2.

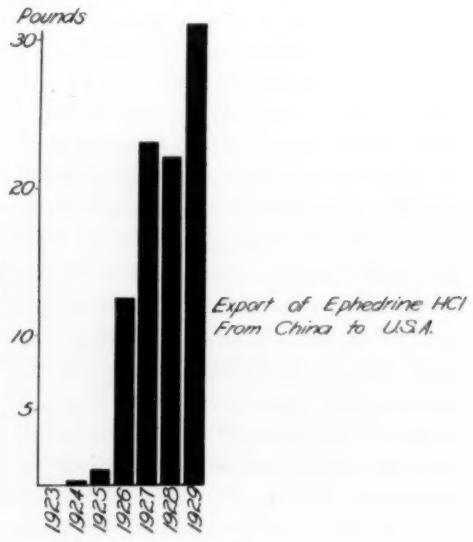


Fig. 3.

served, as stated above, a prolonged rise of blood pressure with the pure principle. This physiological property has now been utilized especially in spinal anesthesia for surgical operations. In animals, ephedrine dilates the bronchioles and in men the drug can similarly relieve asthmatic attacks. It was further demonstrated that ephedrine contracts the mucous membranes of the nose which led to its use in the treatment of rhinitis and hay fever. There are other conditions, such as whooping cough, bronchitis, postural hypotension, Adams-Stokes' syndrome, etc., in which ephedrine has been recommended. Most investigators agree that ephedrine has a real place in therapeutics.

Statistical records definitely indicate a rapid development of the interest in and use of ephedrine during the past few years. Figure 1 shows the number of publications on ephedrine and ephedra from 1921 to 1930. Figures 2 and 3 give the exports from China to the United States of Ma Huang and ephedrine

hydrochloride, respectively—each of which has only recently become a commercial article. It is obvious that the ancient drug Ma Huang has risen to prominence. Many men in China have found for themselves a new calling in the annual collection of Ma Huang (Figure 4). The crude drug is shipped in bales (Figure 5) from China to all parts of the world, for the manufacture of ephedrine. In addition, synthetic compounds have appeared on the market to supplement the supply of the natural product.

It can be safely said that the study of Ma Huang, and subsequently of ephedrine, is another example in medicine where a traditional belief has become a rational therapy. Furthermore, it represents "one of the most international forms of human endeavor" (Barger). The crude drug is of Chinese origin, but the active principle ephedrine was first isolated by a Japanese. The constitution of ephedrine

Fig. 4.

Fig. 5.

was explored and established by several Germans and Japanese, respectively. Its synthesis was first achieved by a Frenchman and by a Japanese, and later the synthetic isomers were resolved by an Austrian. The pharmacological investigation was initiated by several Japanese, but a thorough study was made by an American and a Chinese. Most of the clinical tests leading to the proper use of ephedrine were carried out by several Americans and a Canadian.

Space does not permit me to enumerate the researches of other Chinese drugs undertaken by different workers, but it suffices to say that a good beginning has been made by the Japanese scholars, and the recently published papers by H. P. Chu, T. Q. Chou, B. E. Read and J. C. Liu on several subjects along this line are of great importance. Continued investigations of the Chinese materia medica undoubtedly will add further interesting results.

THE PHARMACOLOGICAL ACTION OF GINGER.*

BY HERBERT M. EMIG.[1]

Due to the numerous cases of "Jake" paralysis reported within the last year, considerable work has been done to ascertain the cause. While many theories have been advanced to explain the paralysis, the cause is still somewhat uncertain; Fluidextract of Ginger contains 83% alcohol. In preparations not conforming to U. S. P. X standards, adulterations may be found. In the collecting of ginger, foreign roots may be gathered, while in the alcohol, government denaturants such as diethylphthalate and cresols may be present. Though "jake" paralysis has been attributed to these adulterants, ginger itself has not been seriously considered.

The effect of ginger as a stomachic is well known, yet its action on other organs has not been established. Therefore, we thought it worth while to investigate its action when given orally or intravenously in large doses.

A perusal of modern textbooks on Pharmacology and Therapeutics (1) failed to reveal any action of ginger other than a local one such as is exerted in the stomach and intestines to relieve flatulence. No statement regarding its action after absorption or the effect of larger doses was found. An experimental study, therefore, seemed advisable.

EXPERIMENTS.

I.

Three rabbits were weighed and given various amounts of ginger. The drug was emulsified with acacia and fed to the animals with the aid of a stomach tube, during a ten-day period as follows:

Day.	Rabbit no. 1 2055 Gm.	Rabbit no. 2 2180 Gm.	Rabbit no. 3 2220 Gm.
1st	2 Gm.	3 Gm.	4 Gm.
2nd	3 Gm.	4 Gm.	5 Gm.
3rd	8 Gm.	9 Gm.	10 Gm.
4th	No drug given		....
5th	12 Gm.	13 Gm.	14 Gm.
6th	14 Gm.	15 Gm.	16 Gm.
7th	16 Gm.	17 Gm.	Died
8th	No drug given		....
9th	18 Gm.	18 Gm.	....
10th	18 Gm.	18 Gm.	....

Rabbits Nos. 1 and 2 showed no ill effects, appearing just as healthy as when the experiment started. The third animal died the eighth day, a post-mortem revealing a bright red liver and a ginger odor from the lungs. It seems probable that death in this case was not due to the ginger.

II.

A concentrated extract of ginger was made by evaporating an alcoholic extract in a vacuum until 1 cc. of the finished preparation was equivalent to 5 Gm. of drug.

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* Read before Chicago Branch, A. PH. A., December 1, 1930.

[1] University of Illinois, School of Pharmacy, from the Laboratory of Pharmacology, College of Medicine, Chicago.

At the rate of 1 cc. per minute, various doses of this product were injected into the marginal ear vein of each of three rabbits as follows:

Rabbits.	Wt. in Gm.	Cc. injected.
1	2470	1.0
2	2350	1.5
3	2310	2.0

Rabbit No. 1 showed a slight reaction of the drug. Rabbit No. 2 immediately became spastic, assuming the position of opisthotonos, legs extended, stiff and immobile. The entire nervous system appeared to be stimulated. The pupils at first were contracted, afterward dilated. Respiration was very rapid, the count being over 180 per minute. The test for sugar in the urine was negative. At the end of a forty-minute period, the spastic condition disappeared and the respiration rate dropped to 144 per minute. The following day this animal appeared perfectly normal. The third rabbit died immediately after receiving the injection.

III.

A dog was given 20 Gm. of ginger through a stomach tube. Two minutes later the animal vomited practically all of the drug as would be expected from the introduction of an irritating substance into the stomach of an animal that can vomit.

Into a normal dog 3 cc. of the concentrated extract (1 cc. = 5 Gm.) were injected intravenously. This resulted in a rapid panting respiration.

A third dog was anæsthetized with morphine and nembutal and prepared for the recording of the blood pressure. Five cc. of the concentrated extract were injected slowly, 1 cc. per minute, into the femoral vein. The results showed a very marked increase in respiration, also a vagus inhibition of rather transient character followed by an increase in blood pressure and heart rate. After section of vagi there was no evidence of vagal inhibition but the respiration, blood pressure and heart rate continued to show a marked increase.

Before and after section of vagi, 50 cc. of 95% alcohol were injected very slowly, 1 cc. per minute, intravenously, displaying no demonstrable effect in respiration, heart rate or pressure.

Five cc. of the concentrated extract were then evaporated on the water-bath and suspended in 2 cc. of ethylene glycol which has very little physiological action when injected intravenously in this amount (2). This preparation of ginger was then injected intravenously. The results indicate a primary transient cessation and a secondary acceleration with a decreased amplitude in respiration. The inhibition of the heart was not as marked as in the case of the concentrated extract, but was definite. The probable reason for this change is attributed to the loss of some active volatile substance during heating. After section of the vagi the only effect was a rise in blood pressure, there being no change in heart rate or respiration.

DISCUSSION.

Since the large doses of ginger that were given to rabbits showed no appreciable effects, it is evident that the drug when taken by mouth exerts very little toxic action. This is probably due to the fact that the amount of active ingredient ab-

sorbed from the gastro-intestinal tract is negligible, or if absorbed, is rapidly rendered innoxious in the body.

From the experiments in which the drug was given intravenously no definite conclusion as to the toxic effect may be drawn because the amount injected into the vein is so much greater than that which would be absorbed by the gastro-intestinal tract. Secondly, if absorption did take place to such an extent it is most probable that the individual constituents would be considerably altered from the original state. Nevertheless these experiments show that ginger does have a decided stimulating effect upon the central nervous system evidentally due to some volatile constituent, since in the experiment where evaporation was accomplished by heating, the action was decidedly lessened.

The change in respiration was effected probably by the stimulation of the respiratory center. The cardiac inhibition is not peripheral in origin since it did not occur after section of the vagi nerves. Although our experiment does not rule out a reflex inhibition, it is our opinion that the slowing of the heart is due to direct stimulation of the vagus inhibitory center. This conclusion is based upon the fact that ginger produces symptoms which may be attributed to a widespread stimulation of the entire central nervous system. Also upon this same basis we assume that the increase in blood pressure is due to a stimulation of the vaso-constrictor center, although a local irritating action on the arterioles must be considered.

CONCLUSIONS.

1. Ginger may be administered in very large doses to rabbits by mouth, without producing any significant action.
2. Ginger contains an active ingredient which definitely stimulates the central nervous system as shown by action in rabbits; and
3. Accelerates respiration and causes vagal inhibition in rabbits and dogs.
4. It also effects a secondary acceleration of pulse rate and rise in blood pressure.

BIBLIOGRAPHY.

(1) Hugh McGuigan, "A Text-book of Pharmacology," W. B. Saunders Co. (1928). Torald Sollman, "Manual of Pharmacology," W. B. Saunders Co. (1926). Cushny, "Pharmacology and Therapeutics," Lea & Febiger (1928).

(2) I. H. Page, *J. Pharmacol.*, 30 (1927), 313.

VETERINARY PRODUCTS, BRAZIL.

The Brazilian Ministry of Agriculture has furnished information to the effect that there is a fairly large demand for veterinary products in Brazil. Although no statistics are available, it is believed that more than 60 per cent of the total demand is satisfied by Federal and State Government departments. Veterinary products, which are distributed by Government institutions, are manufactured in Governmental Laboratories, and up to a short while ago they were distributed free of charge to stock raisers. Medical attendance is extended without charge, and both Federal and State Governments maintain a staff of veterinary doctors who travel throughout the state visiting the many stock-raising ranches. At present medicines are sold to ranch owners at a nominal price, which is less than the cost price to the Government. The most important laboratories are located in Rio de Janeiro, São Paulo and Porto Alegre.

A list of the principal druggists who are known to handle veterinary products in the Porto Alegre District may be obtained. (Vice-Consul A. Whidden Magnitzky, Porto Alegre.)

U. S. P. BIOLOGICAL ASSAY OF COD LIVER OIL, PRESENT AND FUTURE.*

BY JOHN F. ANDERSON, M.D.

The Revision Committee of the United States Pharmacopœia has been in advance of those of other countries as regards the biological assay of various preparations. U. S. P. IX provided for the first time optional methods for the biological assay of certain potent preparations such as Ergot, Digitalis, Strophanthus, etc. These optional methods were extended and made obligatory in U. S. P. X. For the first time in any Phamacopœia there was included in U. S. P. X an optional method for the biological assay of one of the potent principles of Cod Liver Oil. A special committee of those interested in the biological assay of Cod Liver Oil was appointed by the Revision Committee to make a report with recommendations as to the biological assay of Cod Liver Oil for U. S. P. X.

This Committee made a report in which the biological assay of Cod Liver Oil for its vitamin A content was recommended and an assay method for this purpose was given. The report in part stated that "Cod Liver Oil may be assayed for its vitamin A potency and should then contain at least 50 units per Gm. Cod Liver Oil so assayed must be labeled 'This unit is not a measure of the antirachitic activity of Cod Liver Oil.'" While this statement appears to be perfectly plain nevertheless a portion of it has been misinterpreted by many.

It is to be noted first of all that the assay of Cod Liver Oil by U. S. P. X method is optional for the words are "may be assayed for its vitamin A potency." It is also to be noted that Cod Liver Oil when so assayed should contain at least 50 units per Gm. This is not to be interpreted as establishing 50 units per Gm. as the standard for Cod Liver Oil but only as defining the lowest value which Cod Liver Oil can have in order that it may be labeled as having been assayed by U. S. P. X method. Lastly, it will be seen that the U. S. P. X method of assay does not provide for the assay of the antirachitic or vitamin D content of the oil.

It was not long before it was found that certain modifications were necessary in the U. S. P. X method of assay for vitamin A and by unofficial agreement these necessary modifications have been made in the assay method. The most important of these modifications has to do with the necessity of including in the vitamin deficient diet an adequate amount of vitamin D. Criticisms have also been advanced against the method in that it establishes as an end-point the curing of induced symptoms of vitamin A starvation in young albino rats and a specified gain in weight during the period of the test rather than the cure of xerophthalmia. However, it is believed that the majority feel that although the cure of advanced xerophthalmia may be qualitatively more convincing it is at the same time quantitatively more indefinite and gives more irregular results as a criterion of activity than does growth recovery. Also, it is a matter of common experience that larger daily doses of Cod Liver Oil are required to cure definite symptoms of xerophthalmia than are required to induce growth recovery for a period of 35 days.

For the past several years a committee from the American Drug Manufacturers Association has been doing coöperative experimental work upon the

* Read before the Scientific Section, A. PH. A., Baltimore, Md., 1930.

biological assay of Cod Liver Oil. This committee has not yet rendered a final report and their results cannot be given. It will suffice to say, however, that it is believed that the report from this committee will support the use of the criteria of growth recovery with definite specifications regarding vitamin A depletion at the beginning of the test period rather than the cure only of advanced xerophthalmia as the distinctive end-point. Several modifications have also been necessary in regard to the vitamin A free diet, the diet for the colony and the diet for the mother of the test animals.

The general purpose of these modifications is to obtain a vigorous stock; to accomplish the vitamin A depletion of the test rats in gradual stages (avoiding drastic changes of diet); and to obtain rapid growth during the vitamin A free period.

One of the features of the present U. S. P. X method which requires correction is the possibility that other factors in addition to deficiency of vitamin A may influence weight decline during the vitamin A free period as well as weight recovery during the period of feeding Cod Liver Oil. I have already mentioned vitamin D in this connection and also have in mind the physical character of the ration, vitamin B complex, quantity and quality of protein consumed and possibly other factors which influence food consumption.

U. S. P. X contains no method for vitamin D assay. In the last few years, however, there has been general recognition of the importance of vitamin D and consequent appreciation of the equal necessity for U. S. P. methods for the assay of D as well as for A.

The Wisconsin Alumni Research Foundation which administers the Steenbock patent for the irradiation of ergosterol has established a standard method for the assay of irradiated ergosterol. This method provides, in general, for the use as a rickets-producing diet, of Steenbock's No. 2965 or McCollum's No. 3143 and a comparison with definite amounts of Cod Liver Oil of which 75 mg. fed over a period of about 6 days (depending on the food consumption of the individual rats), with examination on the tenth day, is the curative dose.

The rickets-producing effect of these diets depends upon their low phosphorous and high calcium content and it would appear that better quantitative consistency in results might be obtained in a pharmacopœial method if certain limitations were placed upon the phosphorous content of the diet and the exact ratio of calcium to phosphorus were specified. Such specifications would require an analysis of the diet and an adjustment of the addition of calcium carbonate according to the results of this analysis.

It will at once be apparent that whereas the unit for vitamin A is based upon the daily dose, the unit for vitamin D, according to the Wisconsin Alumni Research Foundation, is based upon the total dose. The result is that there is a very great apparent discrepancy in the number of vitamin A and vitamin D units in the same Cod Liver Oil. This apparent discrepancy can be very closely reconciled if the unit for vitamin A is also based upon the total dose rather than upon the daily dose. For example, an oil having 500 present U. S. P. units per Gm. would have a minimum total dose corresponding to approximately 14 units per Gm., and according to the Wisconsin Alumni Research Foundation standard would have 13.3 units per Gm. of vitamin D.

In this connection it may be pointed out that if both units are calculated from a minimum effective total dose that the very convenient value of 10 units per Gm. would be a reasonable minimum standard of activity for both vitamins in Cod Liver Oil. Such a figure for the minimum standard would have the further advantage in that assay results could be directly converted into per cent of U. S. P. minimum standard by simply multiplying the number of units per Gm. by the figure 10, for example, if a sample of Cod Liver Oil assayed 13.3 units of vitamin D and 15 units of vitamin A per Gm. it would have a vitamin D content of 133% and a vitamin A content of 150% U. S. P. minimum standard.

A very practical and significant question arises in connection with the quantitative interpretation of the assay data in both the vitamin A and vitamin D assays. That is—shall the deviation of response which is a biological occurrence common to any bio-assay be made use of in the evaluation of the results or shall it be ignored. This fact of deviation is made use of in the standard method for the assay of irradiated ergosterol in that the method specifies the unit dose in the terms of a definite percentage of positive responses—*i. e.*, 60%. The quantitative importance of also including such a specification in the vitamin A assay cannot be too strongly emphasized.

It is of the highest importance that the required methods for the assay of Cod Liver Oil both for vitamin A and vitamin D be provided in U. S. P. XI. This is of especial importance in view of the great variation in the labeled statement of many brands of Cod Liver Oil, due to the fact that the various firms distributing such oil have established different standards for vitamin potency. It would also seem desirable that the U. S. P. method require a uniform method of labeling, preferably in terms of the number of units per one Gm. of oil and should not permit a labeled statement as to the number of units per ounce, multiple of a gram or any fraction of the permitted figure. Such variations in the labeled statement result in confusion not only to the consumer, but also to the druggist and physician.

NEW BRUNSWICK, N. J.

THE RELAXANT ACTION OF BENZYL DERIVATIVES.*

BY LEWIS C. BRITT AND E. V. LYNN.

We are all familiar with the facts surrounding the introduction of benzyl benzoate as a relaxant of smooth muscle. On the basis of extensive experiments on animals and of some clinical data, Macht (1) in 1918 proposed the use of this compound and other benzyl derivatives as remedies in any condition of heightened tonus, such as uterine colic, vesical spasm, angiospastic conditions, spastic constipation, hiccup, etc. His work was apparently substantiated in practical therapeutics by a number of other observers (2), but the evidence therefor was obtained largely without controls and, hence, liable to considerable misinterpretation. The end-result, however, was an almost immediate adoption of the drugs by a considerable share of the medical profession. If many of the early written reports could be taken literally, benzyl benzoate and its relatives might well be ranked as panaceas for any disorder of smooth muscle due to spasm or increased tonicity.

* Scientific Section, A. PH. A., Baltimore meeting, 1930.

In spite of the first enthusiasm, there is no question but that practitioners are becoming much more doubtful of favorable effects. Prescriptions calling for the benzyl derivatives are decidedly less common and very often one can hear some physician express an opinion that they are of little if any value. Indeed, a survey of the literature shows that there are now few clincal reports of any kind, compared to the very voluminous records of a few years ago. In whatever way we approach the subject, we are led to the conclusion that these drugs do not possess great worth in the treatment of spasmodic conditions of smooth muscle.

On the other hand, various investigators have examined the experimental evidence and corroborated the results in great part (3). It is certain that the benzyl derivatives do relax unstriated muscles *in vitro* and most of the same muscles *in situ*. The intestines, uterus, blood vessels and bronchi are thus affected by local application. When the drugs are administered orally or hypodermically, however, the uniformity of findings is not as good, and the only way of correlating the various investigations is to take dosage and mode of administering into account. The effect on any muscle is directly proportional to the amount given; hence, some of the failures may have been due to inadequate dosage.

In order to throw some light on this subject, we have instituted the experiments which are briefly reported here. The anticipated possibilities in therapy have fallen far below expectations and it seemed advisable to determine the reasons. Errors in the original technic have been suggested, but it is hardly possible that benzyl derivatives do not have relaxing action on direct contact. All of them, however, are handicapped by insolubility in aqueous media, so a few experiments were made with benzyl benzoate on intestinal muscle, comparing its effects with those of two soluble compounds now available, benzyphos and benzycin.

The method and amounts of materials used were as nearly identical with those of the original experiments as could be followed (1). A segment from the intestine of a cat, rat or rabbit was removed and suspended in oxygenated Locke-Ringer solution warmed to, and maintained at, 38° C. throughout the test. The intestinal tissue was attached by a light silk thread to a writing lever and the movements of the muscle were recorded on a slowly revolving drum. When the natural contractions were well established, the drugs, or solutions of them, also warmed to 38° C., were added and the effects were determined by changes in the tracings of the kymographic record. For the sake of brevity, these tracings are not here recorded.

Critics of benzyl therapy have frequently referred to the alcoholic solvent as a possible source of relaxant effects from preparations of benzyl benzoate. Repeated trials on various muscles have shown us that alcohol does actually reduce the tonus, when directly applied. This is in contradiction to the report that "control experiments on excised tissues with ethyl alcohol showed that the action of phenylmethylol on smooth muscle is due to the benzyl grouping and not to the OH component." A 20 per cent benzyl benzoate in 70 per cent alcohol, which is a marketed product, gives practically the same reaction.

Pure benzyl benzoate produced little apparent effect on the intestinal contraction when merely dropped into the Locke-Ringer solution, because the solubility is almost nil. This is not, of course, a legitimate test of its action, since the tissue practically escaped contact with the oil.

In view of the fact that emulsions are commercial articles, such a product was used in the same manner. The effect was, in a way, comparable to that of the alcoholic solution. That acacia itself is not responsible for any of the relaxation was shown by the fact that preparations of it alone produced a primary stimulation of the muscle, which gradually returned to normal, the stimulation probably being due to natural acidity. We can conclude that benzyl benzoate had definite relaxing power on intestinal muscle.

Benzycin and benzyphos, two water-soluble preparations, were tried on similar segments, and the results demonstrated that they are even more active in reducing the muscular tonus. That this is not due to the residual phosphoric acid, in the case of benzyphos, was shown by a trial with sodium phosphate which gave a primary stimulation, followed by an approximate return to normal after a second or two. Dibenzyl, which is insoluble in water, gave no effect on the segment of intestinal muscle.

Assuming, therefore, that the benzyl compounds are actually relaxant to the muscular tissue, and that they are not effective clinically, the explanation must lie in non-absorption or in insufficient dosage. In order to test the latter point, some experiments were performed using varying amounts of benzycin. To each of equal portions of Locke-Ringer solution containing the normal muscle, varied amounts of 1 per cent solution of the drug were added. After several trials, it was found that the minimum quantity is represented by something between 10 cc. and 15 cc. of this solution. Selecting 10 cc. of 1 per cent benzycin as being a minimum necessary to produce any muscular relaxation, we calculate that the final mixture of 35 cc. contained approximately 0.1 Gm. or about 0.3 per cent of the total solution. Since the dosage of benzycin which is recommended is only 0.3 to 1.0 Gm., it may easily be imagined that at any point in the body we would not have more than a small fraction of this essential 0.3 Gm. per 100 cc. of body fluid, unless of course the drug collected at this given point. It is, indeed, reasonable to conclude from these results that the dosage might need to be at least an ounce or more. The limitations of the experiments are apparent, but the real explanation of non-effectiveness after oral or hypodermic administration undoubtedly lies in insufficient dosage.

There still remains the question of how much is absorbed after oral administration. Snapper, Grünbaum and Starkop have already reported (4) work along this line, their results showing that 60 to 90 per cent of the benzyl derivatives given can be recovered in the urine as hippuric acid. Our own experiments were carried out on a few human subjects by giving to them definite quantities of the benzyl compounds and noting the changes in amounts of hippuric acid in the urine. Previously the normal daily excretion of the acid was determined over two days during a constant diet. The results of these tests were anomalous and not at all uniform, due in part to unavoidable variations in food intake. Typical results of two determinations are given. (We hope to continue this phase in the near future.)

	Hippuric acid.	Per Cent of Increase. Found.	Calculated.
Normal, first day	0.94		
Second day	0.94		
Benzyphos, 1 Gm.	1.13	20.2	127.6
Benzyl benzoate, 1 Gm.	3.33	254.2	179.7

Incidentally it was found that benzycin appears to be strongly diuretic; in all of the subjects the quantity of urine was more than doubled. With benzyl benzoate the increase was only 40 per cent. The fairly large doses taken in all cases were found to have no apparent ill-effects.

In conclusion, it might be noted that the benzyl esters are probably hydrolyzed before they have proceeded very far after ingestion. The part of the canal in which absorption takes place will undoubtedly influence the physiological action very profoundly. If hydroylsis occurs in the intestinal tract, one might expect muscular relaxation only at some point above this and certainly not after absorption of the products, unless the latter have such an action. Otherwise, a simple mixture of benzoates, phosphates or succinates with benzyl alcohol would be as efficient.

REFERENCES.

(1) Macht, *J. Pharmacol. Exper. Therap.*, 11 (1918), 419; *J. A. M. A.*, 75 (1920), 567; 75 (1920), 769.

(2) Among others: Litzenberg, *Ibid.*, 73 (1919), 601; Haugwout, *Ibid.*, 73 (1919), 1310; McMurray, *Ibid.*, 75 (1920), 433; Hirschfelder, *Ibid.*, 75 (1920), 634; Laubry, *Ibid.*, 77 (1921), 157.

(3) Stater, *Ibid.*, 75 (1920), 463; 79 (1922), 1362; Nielsen, *J. Lab. Clin. Med.*, 7 (1922), 579; Mason, *Ibid.*, 6 (1920), 62; Gruber, *Ibid.*, 9 (1923), 15, 92 and 685; 10 (1924), 284.

(4) Snapper, *et al.*, *Nederland. Tijdschr. Geneeskunde*, 68 (1924), 3125; *Chem. Abst.*, 19 (1925), 1598.

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THE APPLICATION OF STATISTICAL METHODS TO PHARMACEUTICAL RESEARCH. I. MEASURES OF ACCURACY.*

BY JAMES C. MUNCH.

The key-note of quantitative investigations is accuracy. Many investigations have been incomplete, and faulty conclusions have been drawn from an inadequate number of results, because of the neglect of this important factor. The variability of animals has been used as an excuse for divergent results from time immemorial. On the other hand, the accidental coincidence of two successive tests has been accepted as conclusive proof of correctness of results, irrespective of the nature or number of variables involved.

Simple mathematical procedures have been developed for measuring the accuracy of results. This type of mathematics has been employed so extensively in connection with the investigations of biometricians, physicists and actuaries that the nomenclature of this field follows their terminology (1, 2, 3, 4, 5, 6, 7, 8, 9, 13). This may explain the reluctance of workers in other fields to apply this type of mathematics to the interpretation of research results (11).

Two types of variations must be differentiated: (*1*) constant errors and (*2*) variable errors. Constant errors result from defects in apparatus, incorrect graduation of equipment, erroneous calibration of weights, etc. A constant error will be produced in all measurements with faulty equipment. Increasing the number of observations will have no effect in correction of a constant error. The presence

* Scientific Section, A. PH. A., Baltimore meeting, 1930.

of a constant error may often be detected by repeating observations under different conditions, using different equipment. So long as relative measurements are desired in terms of a common standard measured with the same equipment, the disturbance produced by the presence of a constant error is negligible. However, comparison of absolute values is unsafe unless the magnitude of the constant error is determined.

Variable errors are considered to be the resultant effects produced by the concomitant action of all variations, other than constant errors. Some variations will tend to increase, others to decrease the observed results. When all variable errors act in the same direction the maximum or the minimum value is obtained. When some errors tend to compensate for others an intermediate result is observed. By increasing the number of observations, the general tendency is found for a neutralization of the divergent effects and the number of results unaffected by variable errors increases. When the experimental values are plotted graphically, it is noted that the largest number of results occur in the vicinity of the mean and that the results which differ from the mean decrease in number as one proceeds on either side of the mean value. If the tops of the lines representing individual values are connected by a continuous line, a curve is produced which tends to resemble a cocked hat, or in more modern styles a "tin" army helmet. When a sufficiently large number of experimental results have been obtained, a symmetrical curve is usually produced which is called the "normal frequency curve." The mean, the mode and the median tend to coincide. If the curve be folded upon the axis of the mean, the two halves coincide. An infinitely large number of results are usually required to obtain an exact fit; with 25 to 100 observations, a trend toward this type of curve is often evident.

This type of curve, the "normal frequency curve," results when there is an even chance of an error being greater or less than the mean. Under certain conditions, this probability does not hold, and asymmetric curves are produced. The mathematics of these types of frequency curves are somewhat complicated.

Three measures of accuracy have been developed which are related to the normal frequency curve: (1) h, the modulus of precision; (2) σ, the standard deviation, and (3) PE, the probable error.

(1) The modulus of precision, h, is obtained from the formula of the normal frequency curve

$$y = ke^{-h^2x^2}.$$

As the accuracy of results increases, the value of h increases (8). The method of calculation is somewhat involved and is more difficult to interpret than with the other measures of accuracy.

(2) The standard deviation, σ, is the inflexion point of the normal frequency curve. Between the limit of 1 σ above and 1 σ below the mean, approximately 68 per cent of the observations are expected to occur (1, 5, 12). The method of calculation is given in Table I, which contains results obtained by experienced analysts in the assay of tincture of digitalis by the One-Hour Frog Method (10).

A deviation is the difference between an individual observation and the mean of all the observations in a given series. It will have a positive sign if the observed value is numerically greater than the mean, and a negative sign if it is smaller.

For example, the mean of the differences in the second column of Table I is 1.2; the deviation of the first entry (10) is plus 9 from an arbitrary mean of 1.0, or 8.8 from the mean of 1.2. The deviation of the last entry in the same column (−8) is minus 9 from an arbitrary mean of 1.0, or minus 9.2 from the mean of 1.2.

TABLE I.—ACCURACY OF ASSAYS OF TINCTURE OF DIGITALIS BY 1-HOUR FROG METHOD EXPERIENCED ANALYSTS.

Analyst no.	Difference from true strength.	Deviation from 1.0.		d^2.	Deviation from 1.2.		d^2.	Deviation from 2.5.		d^2.
		Plus.	Minus.		Plus.	Minus.		Plus.	Minus.	
2	10	9	...	81	8.8	...	77.44	7.5	...	56.25
2	10	9	...	81	8.8	...	77.44	7.5	...	56.25
2	10	9	...	81	8.8	...	77.44	7.5	...	56.25
5	29	28	...	784	27.8	...	772.84	26.5	...	702.25
5	0	...	1	1	....	1.2	1.44	....	2.5	6.25
5	15	14	...	196	13.8	...	190.44	12.5	...	156.25
6	10	9	...	81	8.8	...	77.44	7.5	...	56.25
6	5	4	...	16	3.8	...	14.44	2.5	...	6.25
6	0	...	1	1	....	1.2	1.44	....	2.5	6.25
7	10	9	...	81	8.8	...	77.44	7.5	...	56.25
7	0	...	1	1	....	1.2	1.44	....	2.5	6.25
7	5	4	...	16	3.8	...	14.44	2.5	...	6.25
10	− 4	...	5	25	....	5.2	27.04	....	6.5	42.25
10	0	...	1	1	....	1.2	1.44	....	2.5	6.25
10	0	...	1	1	....	1.2	1.44	....	2.5	6.25
12	− 4	...	5	25	....	5.2	27.04	....	6.5	42.25
12	−14	...	15	225	....	15.2	231.04	....	16.5	272.25
12	−16	...	17	289	....	17.2	295.84	....	18.5	342.25
17	29	28	...	784	27.8	...	772.84	26.5	...	702.25
17	0	...	1	1	....	1.2	1.44	....	2.5	6.25
17	−40	...	41	1681	....	41.2	1697.44	Omit	...	.....
18	−10	...	11	121	....	11.2	125.44	....	12.5	156.25
18	− 2	...	3	9	....	3.2	10.24	....	4.5	20.25
18	−10	...	11	121	....	11.2	125.44	....	12.5	156.25
19	−10	...	11	121	....	11.2	125.44	....	12.5	156.25
19	10	9	...	81	8.8	...	77.44	7.5	...	56.25
19	15	14	...	196	13.8	...	190.44	12.5	...	156.25
21	1	0	0	0	....	0.2	0.04	....	1.5	2.25
21	− 5	...	6	36	....	6.2	38.44	....	7.5	56.25
21	− 8	...	9	81	....	9.2	84.64	....	10.5	110.25
Sum	36	146	140	5218	143.6	143.6	5216.80	128.0	124.5	3461.25
Mean	1.2	...	...	173.93	....	...	173.89	....	...	119.35
σ	....	...	...	13.18	....	...	13.18	....	...	10.92
AD	....	9.53	...	.....	9.57	...	.....	8.71	...	.....
PE	....	8.06	...	.....	8.09	...	.....	7.36	...	.....
PE_{Mean}	....	1.46	...	.....	1.47	...	.....	1.36	...	.....

In order to determine σ, the deviation of each individual value from the mean is squared. The square of either a positive or a negative value will give a positive value. The sum of these squares is divided by the total number of observations, giving a quotient which is the average of the squares. The square root of this quotient is σ. In Table I, the sum of the squares of the individual deviations is

5218. Dividing this value by the number of observations (30), the average value of the squares is found to be 173.93. The square root of 173.93 is 13.18, which is the standard deviation about the arbitrary mean of 1.0. When calculated about the true mean of 1.2, the sum of the squares is found to be 5216.80, the average square 173.89 and σ is 13.18. This may be interpreted to mean that 68 per cent of the observed values should occur between Mean $\pm$ σ, (1.2 $\pm$ 13.18), or to range from plus 14.38 to minus 11.98. As a matter of fact, 23 of the 30 values (77 per cent) fell within these limits.

If the individual deviations are represented by "*d*," the sum of the deviations by Σ, and the number of observations by N, the equation for the determination of the standard deviation of an individual observation may be written:

$$\sigma = \sqrt{\frac{\Sigma d^2}{N}}.$$

The standard deviation of the mean of a series of observations is obtained by dividing the standard deviation of an individual observation by the square root of the number of observations in the series. In this instance, the standard deviation of the mean is $\frac{13.18}{\sqrt{30}}$ or 2.4.

The standard deviation has been employed in a number of reports. It is particularly useful in the calculation of correlation coefficients and certain other constants.

(3). The probable error (*PE*) is a more understandable measure of accuracy. It is that particular value such that within the limits of Mean $\pm$ *PE*, one-half of the total observations will be included. Another interpretation is that if one more observation is made, it is just as likely (the chances are even), that it will fall within the range between Mean plus *PE* and Mean minus *PE*, as that it will fall without this range of values.

PE may be calculated approximately as two-thirds (more exactly, 0.6745) times the standard deviation. This involves the labor of squaring the deviations, which is often a tedious procedure. As a slightly less accurate but much more rapid method, the sum of the first powers of the deviations is obtained without regard to their arithmetic sign (whether they are positive or minus) and divided by the number of individual observations to obtain the average deviation, *AD*. The quotient is multiplied by the constant factor 0.8453 to obtain the probable error. In Table I, the sum of the positive deviations from the arbitrary mean of 1.0 is 146, and the sum of the negative deviations is 140. The sum of these two values, representing the total deviations from the mean, is 286. The *AD* of the 30 results is 286/30 or 9.53; the *PE* is 0.8453 $\times$ 9.53, or 8.06. Similarly, the total deviations about the mean of 1.2 are 287.2, the average deviation is 9.57 and the *PE* 8.09.

PE of the Mean is obtained by dividing the *PE* of the individual observations by the square root of the number in the series; in this instance, PE_{Mean} equals $\frac{8.06}{\sqrt{30}}$ or 1.46.

When *PE* is calculated from σ, the value obtained is 8.9, which does not agree very closely with the result obtained from *AD*, namely, 8.06. This suggests that

one or more observations of the series differ widely from those expected in a normal frequency distribution. Inspection of the table reveals an observation of minus 40, which differs widely from the remaining members of the series. The *PE* is serviceable in determining whether this experimental result should be considered in conjunction with the other values, or whether some special variables have influenced it which did not appear to affect the remainder of the series. The result in question, minus 40, has a deviation from the mean of minus 41.2. This deviation is $\frac{41.2}{8.06}$ or slightly more than five times as large as the *PE*. Tables of probability showing the chance of occurrence of random variations as large as various multiples of the *PE* (11, 12) have been recalculated in Table II; a deviation 5 times *PE* has 1 chance of occurrence in 1350 trials. These odds are so large as to justify the conclusion that this particular result resulted from conditions not affecting the remaining reports, and that it may properly be eliminated from the calculations. When this is done, the mean becomes 2.5, σ 10.92 and *PE* from σ, 7.37.

TABLE II.—PROBABILITY OF OCCURRENCE OF DEVIATIONS LARGER THAN THE PROBABLE ERROR (*PE*).

Deviation / *PE*.	One chance of occurrence in ... trials.	Deviation / *PE*.	One chance of occurrence in ... trials.
1.0	2	4.0	143
1.4	3	4.2	216
1.7	4	4.4	333
1.9	5	4.6	520
2.25	8	4.7	660
2.5	10	4.8	825
2.75	15	4.9	1050
3.0	23	5.0	1350
3.25	35	6.0	19,230
3.5	55	7.0	435,000
3.82	100	8.0	1,500,000,000

AD is now 8.71, which yields a value of 7.36 for *PE*, substantially the same result as that obtained in calculations based upon σ.

The proper method of reporting the results of these assays would be, that 29 reports showed a mean of plus 2.5 ± 7.37, which would imply that half of the results fell between plus 9.87 and minus 4.87 (in fact 16 of 29 results, or 55 per cent, fell within these limits), and that PE_{Mean} is 1.36.

When the same samples of tincture of digitalis were assayed by inexperienced analysts (10), the average of 27 reports was minus 15.88 ± 10.08 and PE_{Mean} was 1.94. Half of the reports would be expected to lie between minus 5.80 and minus 25.96 (in fact, 17 of 27 results, or 63 per cent, fell within these limits). In comparing the results of analyses by the experienced and the inexperienced analysts, certain differences are noted. The means, plus 2.5 and minus 15.88, differ by a total of 18.38. To determine whether this difference is significant, its *PE* is determined. The *PE* of the sum or difference of two quantities is the square root of the sum of the squares of the *PEs* of the values compared (9). In this case, the *PE* of 18.38 would be $\sqrt{(1.36)^2 + (1.94),^2}$ or 2.37. The difference between the means is 18.38/2.37, or 7.75 times the *PE*. Reference to Table II shows that

the chance of occurrence of a deviation 8 times its *PE* is approximately 1 in 1,500,000,000. Accordingly, it may be concluded that the difference between these means is significant.

These *PE* values may be interpreted as one expression of the accuracy of results attained. The experienced analysts should agree within 7.37 per cent at least half of the time, and should not differ by more than 25 per cent more often than once in fifty times. The inexperienced analysts, on the other hand, tend to obtain results which are 15 per cent too low, should agree within 10 per cent at least half the time, and should not differ by more than 25 per cent more often than once in ten times.

PE is more generally useful and more readily understood. It may be considered as a suitable, readily determinable measure of the accuracy of the results of quantitative assays.

CONCLUSIONS.

1. The standard deviation (σ) and the probable error (*PE*) are measures of the accuracy of quantitative measurements.
2. *PE* is more convenient to determine and apply.
3. The probability of occurrence of deviations greater than *PE* may be applied as a criterion for the rejection of dubious observations.

BIBLIOGRAPHY.

(1) D. Brunt, the combination of observations (1917).
(2) J. H. Burn, the errors of biological assay, *Physiol. Rev.*, 10 (1930), 146–169.
(3) W. Chauvenet, a treatise on the method of least squares (1868).
(4) C. B. Davenport, statistical methods, with special reference to biological variation, 3rd Edition (1914).
(5) W. P. Elderton, frequency curves and correlation.
(6) H. M. Goodwin, precision of measurements and graphical methods (1919).
(7) J. P. Jacobsen, einige grundbergriffe und sätze betreffs beobachtungen, die als wiederholungen betrachtet werden konnen, sowie eine anleitung zur behandlung solcher beobachtungen, *Dansk Tids. Farm.*, 4 (1930), 49–112.
(8) J. W. Mellor, higher mathematics for students of chemistry and physics (1919).
(9) M. Merriman, a textbook on the method of least squares (1913).
(10) James C. Munch, collaborative assay of tinctures of digitalis by the U. S. P. X 1-Hour Frog Method, *J. A. O. A. C.*, 11 (1928), 365–378.
(11) James C. Munch, "Bioassays," 1931.
(12) R. Pearl and J. R. Miner, a table for estimating the probable significance of statistical constants, *Maine Agr. Exp. Sta. Bull.* (1914), 226.
(13) G. U. Yule, an introduction to the theory of statistics, 6th Edition (1922).

BUCHU PRODUCTION IN THE UNION OF SOUTH AFRICA.

The production of buchu leaves in the Union of South Africa for the season of 1930 was expected to be somewhat smaller than that of the year 1929. The yield from the Government Forest Reserves was estimated at 25,000 pounds, as against 35,000 pounds for 1929; 30,000 for 1928; and 20,000 for 1927. This indicated a total yield from all sources for the 1930 season of about 200,000 pounds.

The bulk of the buchu, usually completely harvested before the end of March, is obtained from plants growing on private farms, while some grows wild and in a semicultivated state, but the yield of the Government Forest Reserves is usually a reliable barometer as to the quantity available. (Consul Cecil M. P. Cross, Cape Town.)

IMPROVEMENTS IN PROCESSES FOR THE IDENTIFICATION AND DETERMINATION OF ALKALOIDS.

(Progress of a Decade.)

BY L. E. WARREN, H. R. WATKINS AND G. L. KEENAN.

Because of their importance in medicine, alkaloids and alkaloid-bearing drugs are of great interest to the chemist. Methods for the assay of drugs have been studied for more than 125 years, and since the U. S. Pharmacopœia first introduced drug assays, about 50 years ago, the recorded researches in this field have reached an enormous volume. During the past decade the studies having a direct bearing on the detection and determination of alkaloids are very numerous. In a review suitable for this symposium it is manifestly impossible to even mention all of the publications on the subject. Therefore, only those contributions are mentioned which report advances judged to be of outstanding importance. So far as practicable the discussion has been limited to alkaloids employed in medicine. The topic is considered under several sub-headings, such as methods of extraction, solvents, precipitants, gravimetric methods, titrimetric procedures, color reactions, microscopical tests, etc.

In 1921 Herzig[1] undertook to assemble the numerous methods that had been suggested for the determination of alkaloidal constituents in crude drugs and their products. Gravimetric, volumetric, colorimetric and polariscopic methods are critically discussed.

METHODS OF EXTRACTION.

Many forms of automatic extraction apparatus have been devised to replace tedious hand operations in analytical chemical methods. Their application to the extraction of alkaloids from solutions by immiscible solvents has received considerable attention during the past decade. Some of the most important contributions to the estimation of alkaloids, from the standpoint of their ultimate effects on analytical processes, are the improvements in automatic extraction apparatus reported by Palkin, Murray and Watkins.[2,3] Two types of extractors were used (*a*) for solvents lighter, and (*b*) for solvents heavier than water.

The efficacy of the inner tube for solvents of lighter gravity depends very essentially upon the diameter of the holes and the flow of solvent through them. Twelve holes of a diameter of 0.31 mm., instead of 16 as originally suggested, are recommended.

The automatic extractors for aqueous liquids were applied to such preparations as fluidextracts, tinctures, elixirs, syrups and solutions of tablets of alkaloid salts. The application of the automatic extractors to galenical preparations of nux vomica, belladonna and stramonium, gave very satisfactory results and did away with the tiresome methods using the hand-shaken separators. In the case of fluidextract of ipecac, higher results were obtained than by the U. S. P. method for this article.

A third type of extractor utilizing the principal parts of the types described in the original papers, such as boiling flask, condenser and jacket but equipped with different inner parts is employed in extracting powdered materials such as hyoscyamus, ipecac, belladonna, nux vomica, etc. The flow of solvent is upward through the powder.

The effectiveness of the apparatus and the method of treatment were thoroughly demonstrated in a large number of assays of hyoscyamus; the quantity of alkaloid extracted amounting, in some cases to three times that obtained by the method of the U. S. Pharmacopœia. The extractor was used successfully for such crude drugs as hyoscyamus, belladonna, ipecac, stramonium and nux vomica. In addition to the apparatus described above several devices have been suggested for the extraction of the active principles from drugs.[4]

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[1] *Arch. Pharm.*, 259 (1921), 249, 308.

[2] *Ind. Eng. Chem.*, 17 (1925), 612. [3] *Ibid.*, 19 (1927), 535.

[4] *Chem. Drug.*, 111 (1929), 230.

SOLVENTS.

In the assay of belladonna leaves Caines and Evers[1] found that a mixture of four volumes of ether and one volume of chloroform gave much less troublesome emulsions than the solvent recommended by the U. S. P. X, *i. e.*, three volumes of ether and one volume of chloroform.

Beal and Hamilton,[2] in continuing their studies on the quantitative determination of alkaloids by immiscible solvents, studied caffeine, morphine, quinine and strychnine. They concluded that the use of lead acetate as a clarifier has no harmful effect upon the subsequent extraction of the alkaloids. The addition of sodium chloride to such extracts, after clarification, increases the amount of alkaloid that may be extracted by a single shake out. The assay of nux vomica was greatly facilitated by extracting the ground drug with weak acid, clarifying the extract with lead acetate, making the solution alkaline and shaking out immediately with the immiscible solvent.

At ordinary temperature morphine requires about 1530 parts of chloroform for solution. Under certain conditions, however, chloroform has been found to be a good solvent for removing the alkaloid from solutions. It has been known for some time that if chloroform be diluted with from $^1/_4$ to $^1/_9$ of its volume of alcohol the mixture will dissolve morphine quite readily, particularly if the aqueous solutions containing the alkaloid be saturated with salt. Early in the decade Glycart and his collaborators in the A. O. A. C.[2a] worked out details for the satisfactory analysis of morphine tablets, using a mixture of 9 volumes of chloroform and 1 volume of alcohol as immiscible solvent in presence of sodium chloride. Palkin, Murray and Watkins[3] found that morphine could be extracted readily from aqueous solutions by chloroform by the use of automatic extraction apparatus.

BENZENE AS IMMISCIBLE SOLVENT.

The use of benzene as an immiscible solvent for the extraction of alkaloids is not new, although its employment for that purpose has never become general. During the past decade several contributions have appeared which indicate that this solvent might be employed with advantage to a much greater extent than it now is in the extraction of alkaloids. Deane and Edmonton[3] employed benzene instead of chloroform in extracting the crude alkaloids from the extract and fluidextract of nux vomica. Chloroform was used for the final extraction of the alkaloids after acid purification. They stated that higher results were obtained with benzene as initial solvent than with chloroform, due to the prevention of losses by the formation of emulsions. The results were the same regardless of whether sodium carbonate or sodium hydroxide were used to liberate the alkaloids.

In the assay of fluidextract and tincture of nux vomica Palkin and Watkins[4] observed that the use of benzene as a solvent gave alkaloidal residues containing less coloring matter than were obtained by the employment of chloroform. This is a distinct advantage particularly if the residues are to be titrated. As a rule alkaloids are much less soluble in benzene than in chloroform but this handicap is not serious if automatic extraction apparatus be employed.

DECOMPOSITION OF ALKALOIDS BY CHLOROFORM.

It has been suspected for some time[5] that certain alkaloids, particularly the more strongly basic ones, when evaporated in chloroformic solution, have a tendency to decompose the solvent with the formation of a hydrochloride of the alkaloid. This phenomenon results in higher values by gravimetric processes and in lower findings by titration. The errors due to this decomposition, however, are usually small.

Rosin[6] has studied this phenomenon and he concluded that strychnine is among the most troublesome alkaloids in this respect. He believes that during the process of evaporation, traces

[1] *Pharm. J.*, 117 (1926), 179.
[2] Jour. A. Ph. A., 9 (1920), 9.
[2a] *J. Assoc. Official Agr. Chem.*, 5 (1921), 150.
[3] *Pharm. J.*, 113 (1924), 96, 133.
[4] Jour. A. Ph. A., 13 (1924), 691. *Ind. Eng. Chem.*, 17 (1925), 612.
[5] Simmer, *Arch. Pharm.*, 244 (1906), 672.
[6] Private Communication to the authors.

of the solvent are retained by the alkaloid. In heating the residue at 100° C. to expel the solvent, interaction takes place between the alkaloid and the chloroform, with the resultant formation of an alkaloidal hydrochloride. The remedy lies in the selection of some other solvent for the extraction of the alkaloids or, if the alkaloid is to be titrated, in adding a measured excess of standardized acid to the partially evaporated chloroformic solution and continuing the evaporation until the solvent has been expelled. The titration may then be completed.

Watkins and Palkin[1] found that much of the chloroform on the market is unsuitable for use in alkaloidal assays, although it complies with the U. S. P. tests for purity. Incomplete recovery of known amounts of alkaloid results from the use of such chloroform. They believe that the fault is due largely to partial neutralization of the alkaloid by the solvent during the process of assay. In most instances the solvent could be purified sufficiently by refluxing it over a strongly basic alkaloid, such as brucine. Apparently the only method at present available by which a specimen of chloroform may be ascertained to be sufficiently pure for alkaloidal assays is to try it on a given weight of a known alkaloid. It is preferable to employ benzene as solvent in place of chloroform where applicable. Watkins and Palkin found that benzene is suitable for atropine, brucine, codeine, quinine and strychnine and for galenicals containing them. It is not satisfactory for morphine.

VOLUMETRIC PROCEDURES.

Rasmussen and Christensen[2] recommended the use of 0.05 *N* sodium borate as the most satisfactory alkali to be used for the back titrations of acid in alkaloidal assays.

Ionescu and Spirescu[3] have developed a new volumetric procedure for the determination of alkaloids which is based on the titration of the mercuric ion with chlorine. The method had previously been used for the determination of acetone.[4] The alkaloidal material is precipitated by an acid solution of mercuric potassium iodide, the precipitate is dissolved in a mixture of nitric acid and sulphuric acid, the excess of nitric acid is destroyed by potassium permanganate, and the mercury determined by standardized sodium chloride, using sodium nitroprusside as indicator. The sodium chloride factor for each alkaloid must be known or previously determined.

ELECTROMETRIC TITRATIONS.

In the last decade a great deal of work has been done in determining the p_H values of solutions of alkaloidal salts; also the p_H ranges of many indicators have been ascertained. As a result, a more rational choice of indicators for alkaloidal titrations has been made possible. Some workers have used the hydrogen electrode; others have employed the quinhydrone electrode; still others have used a platinum electrode.

Wales[5] determined the p_H values for over 30 alkaloids, using the quinhydrone electrode, and has suggested the proper indicator to use in the titration of each, except for two which could not be titrated. Methyl red was found to be a suitable indicator for 18 of the alkaloids tested. Other indicators suitable for certain alkaloids were propyl red, bromocresol purple and bromophenol blue.

The chief advantages claimed for the electrometric titration over the older methods are (*a*) greater accuracy due to a more definite determination of the end-point, (*b*) ability to make titrations without regard to the color of the solution. This permits of titrations of crude extracts of alkaloids, thus eliminating the necessity for time-consuming purification processes.

Sterkin and Helfgat[6] have described a new reagent for the nephelometric detection of minute amounts of quinine. It is composed of equal portions of 0.12% of sodium-arsenate, 2% ammonium molybdate and 2% of hydrochloric acid. It is claimed to be the most sensitive known reagent for quinine, 1 part in 2,000,000 being detectable. The reagent is less sensitive for other alkaloids, such as caffeine, apomorphine, morphine and plasmochine.

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[1] *Ind. Eng. Chem.*, 18 (1926), 867.
[2] *Dansk Tids. Farm.*, 1 (1926), 65.
[3] *Bull. soc. chim. Romania*, 5 (1923), 74.
[4] *Bull. soc. chim.*, 33 (1923), 110.
[5] *Ind. Eng. Chem.*, 18 (1926), 390.
[6] *Biochem. Z.*, 207 (1929), 8.

SOLUBILITIES.

Zeehuisen[1a] has tabulated the physical properties of about 40 alkaloids. He includes the formula molecular weight, crystalline state, melting point, solubilities, etc. This information should prove of considerable value to analysts.

APOMORPHINE.

The determination of apomorphine offers considerable difficulty because the substance is prone to decompose under the conditions of the usual processes of analysis. Recognizing the desirability of having an accurate method for the determination of apomorphine hydrochloride, Eaton and his collaborators in the A. O. A. C.[2] studied methods for the determination of this substance in tablets. The method tentatively adopted by the Association consists in liberating the alkaloid from its salts by a saturated solution of sodium bicarbonate, extracting the liberated alkaloid with ether, washing the ethereal solution of the alkaloid with water, adding a measured excess of standardized acid, evaporating the ether and titrating the excess acid with standardized alkali, using methyl red as indicator. Obviously it is necessary to employ ether that is free from peroxides for this assay.

COCAINE.

Owing to the fact that cocaine is very unstable when subjected to heat or to the action of acids or alkalies, the usual analytical processes for alkaloids are not applicable to preparations containing this alkaloid. Eaton and his collaborators[3] in the Association of Official Agricultural Chemists, worked out a method by which the alkaloid was liberated by sodium bicarbonate, the liberated alkaloid removed by shaking with petroleum benzin, the solvent washed with water and afterward shaken with a measured excess of standardized acid. The acid solution was removed and titrated with standardized alkali, methyl red being used as indicator. These authors also developed a method by which the cocaine was hydrolyzed and the benzoic acid isolated and determined. The last named method was not as satisfactory as the first. Another method used by the A. O. A. C.[4] consisted in liberating the alkaloid with ammonia and shaking out the alkaloid with peroxide-free ether, after which the base was titrated.

EPHEDRA.

Ephedra has been known in Chinese medicine since very early times. Its principal alkaloid, ephedrine, was introduced into occidental medicine only within the past decade. A number of contributions on the assay of ephedra and its preparations have appeared. In general the U. S. P. X process for the assay of belladonna leaves with slight modification has been found satisfactory, certain precautions being taken to prevent losses of the alkaloids by volatilization or oxidation. The collaborators of the Association of Official Agricultural Chemists have elaborated a method[5] for the assay of ephedra, by which the alkaloids, after being liberated by a mixture of sodium carbonate and ammonia water, are taken up with a mixture of chloroform and ether. After purification by the acid shake-out process, the alkaloids are liberated by the dual alkali above mentioned and extracted with ether. The solution is evaporated somewhat and a measured excess of standardized acid added. After further evaporation to remove the remainder of the solvent, the excess acid is titrated with standardized alkali, bromothymol blue being used as indicator.

The alkaloids of ephedra are chiefly ephedrine and pseudo ephedrine, the relative proportions in which they occur being about as 4 to 1. Chou[6] observed that pseudoephedrine oxalate is soluble in water while ephedrine oxalate is very insoluble. This property may be used to separate the two alkaloids. Reed and Feng[7] found that pseudo-ephedrine hydrochloride is

[1a] *Arch. exptl. Path. Pharmakol.*, 86 (1920), 343.
[2] *J. Assoc. Official Agr. Chem.*, 8 (1925), 572. *Ibid.*, 9 (1926), 323. *Ibid.*, 10 (1927), 379.
[3] *Ibid.*, 10 (1927), 347.
[4] *Ibid.*, 11 (1928), 49, 328.
[5] *J. Assoc. Agr. Chem.*, 12 (1929), 290.
[6] *J. Biol. Chem.*, 70 (1926), 109.
[7] *Chi. Jour. Physiol.*, 1 (1927), 297.

about 53 times more soluble in chloroform than ephedrine hydrochloride. An approximate separation of the two alkaloids may be made by an application of this phenomenon.

ERGOT.

The pharmacodynamic activity of ergot lies in two groups of compounds, *viz.*, specific alkaloids and non-specific amino-bases. The desirable therapeutic properties are found in two of the four alkaloids, the other two being inert. The non-specific amines, while of no therapeutic activity are not devoid of physiological power. Their presence in ergot preparations is, therefore undesirable, because of this influence on certain types of bio-assays. A chemical determination of the alkaloids in ergot is of very little value in judging the therapeutic usefulness of the drug, because of the presence of variable amounts of the weak or relatively inactive alkaloids. Some form of bio-assay is necessary.

Thompson[1] has developed methods for separating the non-specific amines from ergot and its preparations after which the specific alkaloids may be obtained in a state of relative purity suitable for bio-assays. He has also worked out a process for the preparation of purified fluid-extract of ergot. The preparation owes its activity to the specific alkaloids. The defatted drug is percolated with weak sodium bicarbonate solution to remove the non-specific amines. The drug is then percolated with an acid, hydroalcoholic menstruum, which removes the specific alkaloids. The activity of this percolate is then determined by biological tests, preferably by the isolated rabbit-uterus procedure.

MYDRIATIC ALKALOIDS.

Several observers have noted that certain mydriatic alkaloids, such as atropine and hyoscyamine are prone to decompose during the analytical manipulations with resultant findings that are low.[2,3,4,5] Gadamer[6] showed that water has a marked hydrolytic effect on these alkaloids. Self[7] believed that the losses were due to the liberation of ammonia from its salts by the alkaloids with consequent lowering of their titrimetric values. Dott[5] concluded that the hydrolysis was brought about by the alkalies used to liberate the alkaloids. Jones[5] noted in 1923 that if a chloroformic solution of the alkaloids of belladonna (as obtained in assay processes) be evaporated by the use of heat some decomposition of the alkaloids will occur owing to the deleterious effect of the moisture in the chloroform. This phenomenon was investigated by Palkin and Watkins.[6] They found that if about 50 cc. of a chloroformic solution of atropine or hyoscyamine, containing a little water and ammonia, were evaporated to a volume of from 5 to 10 cc. all of the ammonia is dissipated. If a measured excess of standardized acid be then added and the remainder of the chloroform then evaporated no decomposition of the alkaloid resulted. The excess acid in the cooled solution may then be titrated. These authors also found some evidence to indicate that if half a volume of neutral, absolute alcohol be added to the concentrated chloroformic solution the evaporation may be continued until dryness is reached without decomposing the alkaloids. This last observation requires confirmation. The precautions advocated by Palkin and Watkins would appear to be of considerable importance in the assay of preparations containing mydriatic alkaloids.

OPIUM.

Since the time of the Egyptians[8] opium has been considered one of the most important drugs. It is official in most pharmacopœias and many of them describe its galenical preparations or alkaloidal derivatives. The most important alkaloid in opium is morphine and most assay methods for opium are directed solely toward the determination of this alkaloid. A rapid and accurate method for the assay of opium has been the desire of chemists for more than one hundred

[1] Jour. A. Ph. A., 19 (1930), 705.
[2] Will and Bredig, *Ber.*, 21 (1888), 2797.
[3] *Arch. Pharm.*, 239 (1901), 294.
[4] *Pharm. Jour.*, 94 (1915), 521.
[5] *Ibid.*, 107 (1921), 286.
[6] Year Book Pharm., 60 (1923), 702.
[7] Jour. A. Ph. A., 16 (1927), 21.
[8] Wooton, "Chronicles of Pharmacy," 1 (1915), 34, *et seq.*

years and no other drug has received so much analytical attention in research directions as this. A great many papers and at least two inaugural dissertations concerning the assay of opium have appeared during the last decade.

Undoubtedly the most important contribution to the subject is an inaugural dissertation by Hollman.[1]

In 1920 Jermstad[2] reported an exhaustive study of numerous methods for the assay of opium. He considered the procedure under 6 classes. He found that all of the official lime methods (U. S. P. IX, B. P. 1914, Codex (1908), Japan, III, Netherlands IV, and Spain) gave impure morphine and the results were generally too high. If the morphine be freed from narcotine and calcium meconate by means of alcohol the results agree with the Helfenberger (water extraction) method.[3] Of the unofficial lime extraction methods tested by Jermstad, only that of Beckurts is usable. He could find but very little difference between methyl red and iodeosin as indicators. As a result of his observations, Jermstad devised and recommended a modification of Helfenberger's method in which lime is not used. Jermstad's method was not adopted by the U. S. P. X.

In consulting with analysts we found that almost the only criticism offered of the U. S. P. X assay process for opium (other than its length) is that too little distilled water is directed to be used in extracting the drug. We are informed that the Import Office of the Treasury Department of the Government uses the U. S. P. X method of assay and that this Office has no criticism of the method to offer.

MICROSCOPICAL TESTS.

In the microscopical identification of the alkaloids, two methods may be employed. The most familiar one, the microchemical, relies upon the formation of a characteristic crystalline precipitate which is produced upon the application of a reagent. A chemical reaction takes place with the resultant formation of crystals or groupings of crystals, the individual crystals or aggregates of these being so characteristic that they are useful for identification purposes. Another method which has been more commonly used during the past decade for the identification of the alkaloids is the immersion method which requires that the alkaloid or its salt be crystalline. In contradistinction to the microchemical method, no reaction takes place between the alkaloid (or salt) and reagent to produce a crystalline precipitate but the crystalline material is mounted in a suitable menstruum (usually oily in nature), and certain physical characteristics are observed and measured with the microscope. This method will be discussed more in detail subsequently. Within the limited space assigned to this discussion, it will be possible to review only some of the outstanding developments in the microscopical identification of the alkaloids which have taken place in the past ten years. The achievements in the strictly microchemical field first will be considered.

In the early part of the past decennium, Stephenson's[4] work on the microchemistry of the alkaloids appeared. This is probably one of the most exhaustive compilations of tests in English. It contains a table of reactions of fifty-one alkaloids with thirty-five reagents and is illustrated with one hundred sixty-two photomicrographs. Somewhat later (1922) the work of Nelson and Leonard[5] on the picrates appeared. They worked out a convenient reference chart for quickly placing the precipitates into crystal groups for the purpose of determining from the "habit" of the crystals what base might be present.

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[1] Dissertation, Amsterdam (1926); *Pharm. Weekblad*, 63 (1926), 1337, 1370, 1393.

[2] Dissertation, Basel (1920); *Schweiz. Apoth. Ztg.*, 58 (1920), 277, 289, 301, 421, 462; *Repert. Pharm.*, 32 (1920), 257.

[3] Helfenberger, *Annalen* (1897), 188.

[4] "Some Microchemical Tests for Alkaloids" (1921).

[5] *J. Am. Chem. Soc.*, 44 (1922), 369.

The methods followed in the studies of Heiduschka and Meisner[1] were chiefly concerned with the extraction and sublimation of the alkaloids and their subsequent identification by many well-known microchemical tests, such as those given in the texts of Tunmann,[2] Behrens[3] and others. Sublimates of the following alkaloids and salts were studied: caffeine, theobromine, strychnine, cinchonine, morphine, codeine, apomorphine hydrochloride, thebaine, narcotine, quinidine, quinine, atropine, cocaine, brucine, scopolamine hydrobromide, aconitine, narceine, colchicine and veratrine.

For the identification of procaine in concentrations of five per cent, Deniges[4] recommended a five per cent solution of $NaClO_4$, a drop of which is added to the sample to be tested. In the early part of the reaction, spheroidal particles appear, but on stirring, rod-shaped crystals of procaine perchlorate will gradually form (illustration shown in original paper). When the free base is at hand, it is preferable to dissolve it in five to ten per cent acetic acid preliminary to making the final tests.

In 1923 Cole[5] considered the use of potassium ferrocyanide as a reagent for alkaloids. Previous to this time this reagent had been used, but a complete list of the alkaloids yielding crystalline precipitates with it had not been made.

The work of Maplethorpe and Evers[6] in 1925 described the picrates of the opium alkaloids, these being crystallized from various percentages of alcohol (methylalcohol in the case of morphine picrate).

In 1925 (and later in 1928), Cumming and Brown made a very extensive and systematic study of the hydroferro- and hydroferricyanides of a number of alkaloids. In the first section of the work,[7] the hydroferrocyanides and hydroferricyanides of the following alkaloids were prepared: cinchonine, quinine, cocaine, narcotine, brucine and strychnine.

The second part[8] of the work applies the same technique to the following alkaloids: sparteine, cinchonidine, hydrastine, nicotine, pilocarpine, piperine, narcotine, ecgonine, codeine and morphine.

Van Urk[9] in 1927 obtained crystalline precipitates with morphine when tested with $HgCl_2$, IKI, $KBiL_4$ and CsCdI. Codeine gave a characteristic precipitate with picrolonic acid and also with KSCN and $PtCl_4$ in addition to the reagents used for morphine.

Some attention was given by Beckman[10] to the identification by sublimation, color tests, and crystallization of eighteen alkaloids and substances containing them.

More recently Glycart[11] and his collaborators have been testing out the microchemical methods for various alkaloids in connection with the work of the Association of Official Agricultural Chemists. It is the intention of this collaborative work to ascertain how reliable these various tests are in the hands of different workers, and the effect of possible variations in technique on the resultant crystalline formations. Cocaine, codeine, heroin, morphine, strychnine, atropine, brucine, caffeine, pilocarpine, and the principal alkaloids of cinchona have been studied.

OPTICAL-CRYSTALLOGRAPHIC STUDIES.

The optical immersion method, as already indicated in the early part of this paper, is concerned with the determination of certain physical constants on crystalline material immersed in liquids of known refractive index. Among other constants, which may be measured, the refractive indices of a crystalline substance are the most important and diagnostic for deter-

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[1] *Archiv der Pharmazie*, 261 (1923), 102; 265 (1927), 455.
[2] "Pflanzenmikrochemie" (1913).
[3] "Anleitung z. Mikrochem. Anal." (1895–1907).
[4] *Bull. Soc. Pharm., Bordeaux*, 62 (1924), 119.
[5] *Philippine J. Sci.*, 23 (1923), 97.
[6] *Pharm. J. and Pharm.*, 115 (1925), 137, 178.
[7] *J. Soc. Chem. Ind.*, 44 (1925), 110T; 47 (1928), 84T.
[8] *Pharm. Weekbl.*, 63 (1926), 560.
[9] *Ibid.*, 64 (1927), 371.
[10] *Pharm. Ztg.*, 73 (1928), 1165. *Ibid.*, 74 (1929), 28.
[11] *J. Assoc. Official Agr. Chem.*, 10 (1927), 370; 11 (1928), 353; 12 (1929), 282; 13 (1930), 315.

minative purposes. In order to determine these various optical properties it is necessary to make use of a polarizing microscope, equipped with an analyzing and polarizing nicol and the other accessories with which such an instrument is usually provided. The material to be studied is finely powdered and a small amount immersed in a liquid of known refractive index, this liquid usually being oily in nature. By repeated trials in different liquids it is possible to establish definite refractive index values which are very useful in identifying an alkaloid or its salt. Most of the crystalline alkaloids will have three significant refractive indices. However, as Benedict[1] has already pointed out, partial optical data are often very important, and, although at most only two indices of refraction may be determined on some substances, these are very useful and suffice for identification purposes. Of course, for a complete optical description of a substance for the first time, it is essential that all the optical data which it is possible to obtain be recorded.

The application of such a method makes its usefulness practicallly unlimited. Petrographers have made wide use of it for the identification of natural minerals and Wright[2] in 1916 called attention to its possibilities as an aid in analytical work, and was one of the first to indicate its application to the study of alkaloids. In 1918 Wherry[3] described the method in detail, especially with reference to the microscopical identification of alkaloids. Minute directions are given for the study of the material first in ordinary light, giving attention to the color or hue of the substance, its crystal habit, such as the geometrical form or outline of the crystals, a determination of the interfacial angles, and the refractive indices, which are the most important of all the constants and the most readily determined.

Wherry, in 1918, in collaboration with Yanovsky[4] made a study of the cinchona alkaloids according to this method. Yanovsky purified and recrystallized the alkaloids, crystallizing them from both benzene and alcohol, while the senior author measured the optical properties.

In 1919 the same authors[5] made an optical-crystallographic study of morphine and certain of its derivatives, namely, codeine, ethylmorphine and diacetylmorphine. Keenan and Hann[6] later recorded the optical properties of conidine hydrochloride, finding that methyl salicylate (oil of wintergreen), with an index of 1.535, was very convenient for this purpose.

In 1927, Keenan[7] determined the significant refractive indices of the following alkaloids or alkaloidal salts: brucine sulfate, morphine sulfate, atropine, diacetylmorphine, codeine sulfate, quinine sulfate and cocaine hydrochloride. Further work is being done on these alkaloids. Peterson's study[8] of ephedrine and its salts contains optical-crystallographic data on ephedrine hydrochloride and ephedrine sulfate as obtained by Walcott.

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[1] "The Polarizing Microscope in Organic Chemistry," *Ind. Eng. Chem., Anal. Ed.*, 2 (Jan. 15, 1930), 91.

[2] *J. Am. Chem. Soc.*, 38 (1916), 1647.

[3] *Bull.* 679, U. S. Dept. Agr. (1918).

[4] *J. Am. Chem. Soc.*, 40 (1918), 1063.

[5] *J. Wash. Acad. Sci.*, 9 (1919), 505.

[6] *J. Am. Chem. Soc.*, 47 (1925), 2065.

[7] Jour. A. Ph. A., 16 (1927), 837.

[8] *Ind. Eng. Chem.*, 20 (1928), 388.

Food & Drug Administration,
Washington, D. C.

Marked Decline in Gum Tragacanth Imports.—A decrease occurred in the importation of gum tragacanth during the 11-month period of 1930, when imports amounted to 908,179 pounds, valued at $405,127. During the same period of 1929 gum tragacanth imports amounted to 1,867,808 pounds, valued at $819,214. Gum arabic, while showing an increase in value of imports in 1930, declined 1,916,000 pounds. Imports of gum arabic during the first 11 months of 1929 and 1930, respectively, were: 8,461,152 pounds, valued at $910,893, and 6,545,149 pounds, valued at $933,836. Crude balsam imports declined during the 11-month period of 1929 and 1930, respectively, from 374,641 pounds, valued at $212,302 to 362,665 pounds, valued at $184,536.—U. S. Department of Commerce.

BIBLIOGRAPHY OF PHARMACEUTICAL RESEARCH

Compiled by A. G. DuMez, Reporter on the Progress of Pharmacy.

All articles in these lists will be presented in abstract form in the bound volumes of the Year Book, which is issued annually. Those desiring abstracts immediately can obtain them for a fee of one dollar each by communicating with A. G. DuMez, University of Maryland, School of Pharmacy, N. E. cor. Lombard and Greene Sts., Baltimore, Maryland.

PHARMACOPŒIAS AND FORMULARIES.

Anon.
General articles of the Swiss Pharmacopœia V
Pharm. Acta Helv., 5 (1930), 271
Amin, I. S.
Pharmacopœia revision notes
Chem. & Drug., 114 (1931), 49
Boyle, J. F., and Franklin, J. H.
Pharmacopœial revision note on Liquor Carmini
Pharm. J., 125 (1930), 648
Brunker, A. A., and Boyd, D. W. P.
Pharmacopœia revision notes
Chem. & Drug., 114 (1931), 7
Duckworth, J. F.
Pharmacopœial revision note on Linimentum Camphorum
Pharm. J., 125 (1930), 647
Ferrey, C. J. W.
Pharmacopœial revision notes on phenol-water mixtures
Pharm. J., 126 (1931), 58
Jones, A. F.
Comments and criticisms of the British Pharmacopœia
Pharm. J., 125 (1930), 647
Meachem, E. R.
Pharmacopœial revision note on Syrupus Ferri Phosphatis Compositus
Pharm. J., 126 (1931), 10
Sigfried, K.
Galenicals of the Swiss Pharmacopœia V
Pharm. Acta Helv., 5 (1930), 255

PHARMACEUTICAL PREPARATIONS.

Bateson, F. R. C.
Comparison of certain suspending agents
Pharm. J., 126 (1931), 521
Bumming, G.
Color of ethereal tincture of valerian
Apoth.-Ztg., 46 (1931), 47
Christensen, E. V.
Preparation of liquid paraffin emulsions
Arch. Pharm. Chemi., 38 (1931), 6
Kroeber, Ludwig
Fluidextract of Drosera rotundifolia
Pharm. Zentralh., 75 (1931), 19
Kleinschmidt, Frederick
Comments on solution of magnesium citrate
Jour. A. Ph. A., 20 (1931), 47
Kroeber, Ludwig
Fluidextract of tansy
Pharm. Zentralh., 75 (1931), 38
Woodhead, J. E.
Liquor Plumbi Subacetatis Fortis
Pharm. J., 126 (1931), 28

PHARMACOLOGY, TOXICOLOGY AND THERAPEUTICS.

Feist, K., and Klatt, F.
Biologic method of differentiating morphine-containing tinctures of different strengths
Apoth.-Ztg., 46 (1931), 30
Gold, Harry, *et al.*
Use of therapeutic effects as end-points in the biologic titration of digitalis bodies
J. Pharmacol. & Exper. Therap., 41 (1931), 89
Hanzlik, P. J., *et al.*
Importance of exact preparation of tincture of digitalis and number of pigeons in the pigeon-emesis method of assay
J. Pharmacol. & Exper. Therap., 41 (1931), 5
Jendrassik, L., and Will, G.
Experiments in the physiological titration of belladonna extract and other drugs with atropine-like action
Arch. exptl. Path. Pharmakol., 153 (1930), 94; through *Chem. Abstr.*, 25 (1931), 169
Levine, B. S.
Efficacy tests of bactericidal and bacteriostatic reagents for use in specific chemotherapeusis
J. Lab. Clin. Med., 16 (1930), 52
Oltman, Theodore V., and Crandall, Lathan A., Jr.
Acute toxicity of glyceryl trinitrate and sodium nitrate in rabbits
J. Pharmacol. & Exper. Therap., 41 (1931), 121

Paget, Marcel, and Leblond, Charles-Philippe
Study of the inactivation of adrenaline by formol
J. pharm. chim., 12 (1930), 531
Rising, L. W., and Lynn, E. V.
Toxicological investigation of chloral hydrate
JOUR. A. PH. A., 20 (1931), 9
Stockton, A. B., *et al.*
Clinical action and therapeutic uses of synephrine
J. Pharmacol. & Exper. Therap., 41 (1931), 11

ANIMAL AND VEGETABLE DRUGS.

Burlage, H. M.
Phytochemical study of Artemisia Heterophylla, Heracleum Lanatum, Melissa officinalis and Micremeria Douglasii
JOUR. A. PH. A., 20 (1931), 33
Clark, E. P.
Preparation and properties of deguelin, a constituent of tropical fish-poisoning plants
J. Am. Chem. Soc., 53 (1931), 313
Fenger, F., *et al.*
Geographic location and the iodine content of the thyroid gland
J. Am. Chem. Soc., 53 (1931), 237
Fischer and Hoekheimer
Examination of ergot
Süddeut. Apoth.-Ztg., 70 (1930), 518; through *Chem. Abstr.*, 25 (1931), 170
Harada, Taichi
Estimation of diastatic enzyme preparations
Ind. Eng. Chem., Analyt. Ed., 3 (1931), 1
Orient, Julius
Examination of the active constituents of Asarum europeum
Pharm. Monatsh., 11 (1930), 174; through *Chem. Abstr.*, 25 (1931), 169
Vollmar, Ralph C.
Quantitative determination of pyrethrin I
Ind. Eng. Chem., Analyt. Ed., 3 (1931), 110
Vyvere, P.
Cultivation of medicinal plants in Belgium
J. pharm. Belg., 13 (1931), 1

ALKALOIDS AND GLUCOSIDES.

Baggesgaard-Rasmussen, H.
Examination of tetrapon, a preparation of opium alkaloids
Dansk Tids. Farm., 4 (1930), 285
Eder, R., *et al.*
Determination of the purity of alkaloids in the Swiss Pharmacopœia V
Pharm. Acta Helv., 5 (1930), 276
Holt, M. Leslie, and Kahlenberg, Louis
Potentiometric titration of alkaloids with bimetallic electrodes
JOUR. A. PH. A., 20 (1931), 11
Levi, Alfred A.
Alkaloid-glucoside found in Solanum aviculare
J. Soc. Chem. Ind., 49 (1930), 395 T
Mannich, C., *et al.*
Glucosides of Digitalis lanata
Arch. Pharm., 268 (1930), 453
Rojahn, C. A., and Seibert, Rudolf
New methods for the colorimetric estimation of alkaloids
Arch. Pharm., 268 (1930), 499

ESSENTIAL OILS.

Batuecas, T., and Morales, E.
Physiochemical analysis of Eucalyptus globulus oil
Anales soc. españ. fís. quím., 28 (1930), 1036; through *Chem. Abstr.*, 25 (1931), 172
Bodendorf, Kurt
Examination of essential oils
Arch. Pharm., 268 (1930), 486
Kok, J.
Identification of artificial balsam of Peru
Pharm. Weekbl., 68 (1931), 29
Lehman, Arnold J., and Lynn, E. V.
Leaf oil of Picea Sitchensis
JOUR. A. PH. A., 20 (1931), 29

OILS, FATS AND WAXES.

Dickhart, W. H.
Color reactions of fatty oils
Oil & Fat Ind., 7 (1930), 391; through *J. Soc. Chem. Ind.*, 50 (1931), 32
Peacock, D. H., and Thoung, Chit
Seed oil of Asteriastigma macrocarpa
J. Soc. Chem. Ind., 50 (1931), 7 T

ANALYTICAL METHODS.

Cattelain, E.
New method for the estimation of mercury in mercury cyanide
J. pharm. chim., 12 (1930), 529
Deniges, Georges
Sensibilization of the iodo-mercuric reaction for the detection of mercury
Bull. soc. pharm., Bordeaux, 68 (1930), 207
Ekman, E., and Samyschlayewa, A.
Use of the analytical quartz lamp in the examination of perfume materials
Riechstoffindust., 5 (1930), 182

Gordon, Samuel M.
Specific gravity of mixtures of chloroform and benzyl alcohol
Jour. A. Ph. A., 20 (1931), 15

Jean, M.
Reduction of the salts of mercury by means of hypophosphorous acid
Bull. soc. pharm., Bordeaux, 68 (1930), 239

Liverseege, J. F.
Notes on the estimation methods of the British Pharmacopœia
Pharm. J., 126 (1931), 31

Smith, G. Frederick, and Koch, W. W.
Perchloric acid as a new standard in acidimetry
Ind. Eng. Chem., Analyt. Ed., 3 (1931), 52

ORGANIC CHEMICALS.

De Haas, G.
Simple method for the detection of β-naphthol
Pharm. Weekbl., 68 (1931), 29

Dragenesco, Adela L., and Weinberg-Sachetti, Eugenie
Determination of alkalinity and silver in protargol
J. pharm. chim., 12 (1930), 536

Guthrie, John D.
Method for the determination of peroxidase activity
J. Am. Chem. Soc., 53 (1931), 242

Koelsch, C. Frederick
Identification of phenols
J. Am. Chem. Soc., 53 (1931), 304

Lindwall, H. G., *et al.*
Preparation of certain brominated cinchophens
J. Am. Chem. Soc., 53 (1931), 317

Scott, R. D.
Application of a bromine method in determination of phenol and cresols
Ind. Eng. Chem., Analyt. Ed., 3 (1931), 67

THE SOCIETY FOR THE HISTORY OF PHARMACY.

The annual meeting of the Society for the History of Pharmacy will be held in Vienna during May.

PHARMACY IN ICELAND.

The practice of pharmacy in Iceland is confined to ten establishments, serving a total population of about 100,000, situated, two in Reykjavik, and one in each of the following places: Hafnarfjordur, Stykkisholmur, Isafjordur, Saudarkrok, Akureyri, Seydisfjordur, Vestmannaeyjar and Eyrarbakki. The pharmacies are under control of the health authorities, who appoint a qualified pharmacist to inspect the premises annually. Only those who have passed a pharmaceutical examination, held in the college at Copenhagen (there is no such establishment in Iceland), may be appointed to practice. The requirements for qualification as a pharmacist in Iceland are the same as those for Denmark. One of the ten pharmacists possesses a license which is transferable to any other person fulfilling the requirements as to qualification. The other licenses may only be used by the holders, and when vacant must be officially advertised and granted by the authorities. Importation of drugs is confined to pharmacists. The district physicians, numbering about forty, are allowed to keep small stocks of necessary medicaments.

ARGENTINE PHARMACY LAW CHANGES.

Argentine pharmacy and drug regulations are being formulated by the National Department of Hygiene and present indications are that they are intended to nationalize as far as possible the drug industry of the country by vesting in Argentine pharmacists all proprietary rights to formulas registered by the pharmacists. All products whose formulas are listed in recognized pharmacopœia are excluded from classification as medicinal specialties coming under protective clauses. Proprietary rights, in other words, are to be recognized only in such products as cannot be prepared by ordinary pharmacists. Many other provisions are reported as being subjects of contention for foreign manufacturers of drug and pharmaceutical products. No formal announcement has been made by the Argentine government.

NEW ZEALAND CONFERENCE.

The annual New Zealand Pharmaceutical Conference will meet in March at Rotona—the center of the thermal region and the hub of Maori life. This section is very much like the Yellow Stone.

The Australian and New Zealand Formulary, 5th edition, has been published by the Australasian Pharmaceutical Conference on behalf of the pharmaceutical societies of Australia and New Zealand.

DEPARTMENT OF BUSINESS MANAGEMENT

Conducted by Paul C. Olsen.*

COMMENTS, QUESTIONS AND SUGGESTIONS ARE INVITED AND WELCOME.

Readers are invited to submit comments, criticisms and suggestions regarding the material which appears in this department. The Editor also will undertake to answer questions regarding general problems of business mangement. Letters of general interest will be published, but the writer's name will not be revealed without his permission.

IMPROVING THE PROFESSIONAL STANDING OF A DRUG STORE.

BY PAUL C. OLSEN.

SOME OF THE INFLUENCING FACTORS.

1. A Clean Store.—Cleanliness in the external appearance of a drug store has a tendency to make people think that the prescription-filling activities are carried on with similar care. This impression is created both with professional and with lay patrons. How many physicians would direct their patients to take prescriptions to a drug store in which they knew that prescription utensils and ware, if washed at all, were washed in cold water?

2. A Drug Store Atmosphere.—A store which is instantly recognizable as a pharmacy is the type of drug store to which people like to take prescriptions and to which professional people like to refer their patrons. This means, in turn, that the departments and side lines must not be so predominant that the character of the store as a pharmacy is overshadowed.

3. Superior Soda Fountain Service.—The connection of superior soda fountain service with the professional standing of a drug store is often not understood or is misunderstood by drug store proprietors. But customers have a habit of thinking that if quality and service are extraordinarily good at the fountain and they see that scrupulous care is exercised there, similar superior quality service and scrupulous care likely obtains in all departments of the store.

4. Alert Intelligent Telephone Order Service.—Most of the professional services rendered by a pharmacy are to professional people and to their patients, usually patients who are not in health. This frequently means that such customers are not in a position to come to the store. A telephoned request to call at a patient's home for a prescription is one result of this service. Still another and more frequent one is the telephoned prescription from the physician himself. Certainly a pharmacist must be alert and understanding to properly transcribe and fill these telephone orders in a way which will inspire confidence in his professional understanding and ability.

5. Prompt Efficient Delivery Service.—A necessary concomitant of alert intelligent telephone service is a delivery service of similar quality. A prescription which is promised at 8:00 P. M. and delivered at 9:30 P. M. not only may seriously affect the patient but, even if this is not the case, it certainly does not enhance the store's reputation for dependable service.

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* Lecture on Business, Columbia University and Philadelphia College of Pharmacy and Science.

6. Discouragement of Undesirable Attempts at Self-Medication.—No pharmacy can hope to win the confidence of physicians and other professional people if the store is full of displays and signs urging the self use of medicaments which professional judgment dictates should not be employed without medical direction.

7. Suitable Prescription Room Equipment and Supplies.—Many of the pharmacies with the largest volume of prescriptions make a feature of the open prescription room so that all people visiting the store can see the skill, care and precision with which prescriptions are filled. While in a pharmacy with a concealed prescription department, deficiencies in prescription equipment are not likely to be evident to customers coming to the store, there is usually no way to conceal these deficiencies from visiting physicians. A physician will not be favorably impressed by a "hole-in-the wall" prescription room with a soiled iron sink, neglected balances, apparatus and utensils and a disordered array of prescription ingredients.

No physician needs to be reminded that the potency of a number of important preparations is affected by age, light and other influences. Carelessness in prescription room stock keeping is sure to be taken as a certain sign that all preparations used are not likely to be of standard quality and condition. Customers may be lost by one carelessly washed bottle or a soiled, smeared label.

8. Up-to-Date Knowledge of Pharmacy and Related Sciences.—It is only natural that physicians will hold in highest regard those pharmacists who not only impress them with their professional confidence but who also are able to discuss intelligently with them the mutual problems of medicine and pharmacy and related sciences and, from time to time, give to physicians facts about new preparations which they may consider useful in their practice.

EXCERPTS FROM PROPAGANDA ISSUED BY WISCONSIN PHARMACEUTICAL ASSOCIATION.

"It is surely as important that your medicine be prepared by a properly qualified pharmacist, as it is to have your disease treated by a competent physician, or your house built by a master carpenter, or your children educated by experienced teachers.

"The only persons allowed to perform the responsible duty of preparing medicines for the sick, in this store, are the pharmacists who have had years of experience in this work, and are properly licensed by the State Board of Pharmacy.

"To be chosen to compound your prescriptions is to show your regard for our professional ability. May we solicit your trade on the following basis: Absolute accuracy, pure drugs, immediate attention, reasonable price, prompt deliveries, but above all, because we have prepared ourselves by years of study and training to execute the physician's orders correctly."

"That the ethical pharmacy has been and is being conducted on successful merchandising lines is becoming more and more apparent, as we see it, the successful pharmacy can no more be conducted without recourse to modern merchandising methods than can any other line of business. The present-day pharmacist is not following his vocation simply for his love of pharmacy, much as he is inspired by the humanitarian aspects of its contact with his fellowmen. He is engaged in pharmacy as a means of livelihood and in the hope that it will yield for him a competence to provide the necessities of life in his advancing years."—L. O. BRECKWOLDT, Sargent's Pharmacy, Chicago.

PHARMACEUTICAL HISTORY IS BEING MADE.*

BY ROBERT J. RUTH.

At this time, when many disturbing influences prevail to ruffle our pharmaceutical tranquillity, extreme satisfaction can be gained from a contemplation of the status of professional pharmacy at the present day, which has been brought about through the achievements of the past decade.

Perhaps the remarkable accomplishments attained for pharmacy during the past decade are the fruits born as a result of the seed planted by those grand old men of American Pharmacy who preceded us. Procter, Parrish, Remington, Maisch, Rice, Squibb, Ebert, Diehl, Bastin and many others labored arduously in bygone days and, no doubt, in their far-reaching minds they knew that we would see the results of their works. I am not unmindful of the splendid men in pharmacy to-day—men of fine minds and ability—who carry on where their forebears ceased their efforts only when summoned from this earth and the work which they loved.

A short time ago I returned from a lecture trip of the entire United States. It was my pleasure to visit, without exception, every college of pharmacy in the country.

Colleges of pharmacy are, nearly every one of them, housed in splendid and imposing buildings, many of them new. Those colleges still in old and unsatisfactory quarters are cheered by the knowledge that they soon will have new buildings. This is in sharp contrast with the status of pharmacy college buildings of a decade ago. That pharmaceutical education has within the past ten years made the greatest strides of any like period in the history of pharmacy is irrefutable.

As the building situation has improved, so have the colleges of pharmacy from the standpoint of physical equipment. The faculty situation has not been neglected because of the progress made as manifested by new buildings and equipment. Teaching forces are much larger and the best qualified men to be found are teaching the various subjects which comprise the curricula of the colleges of pharmacy.

What of the status of the student of pharmacy? He enjoys a campus standing never before accorded a student of pharmacy in all large American universities. Pharmacy students are in evidence in the student activities of our universities and colleges. You will find them on the varsity football teams and prominent in other branches of athletics. They are leaders in political, literary, musical and fraternity circles. They will have a tremendous and far-reaching influence upon the future of pharmacy.

The past decade has seen the raising of college courses from two to three years. Deans and professors of colleges of pharmacy are enthusiastic and optimistic when discussing the minimum four-year course in pharmacy which will go into effect in 1932, as decided at the meeting of the American Association of Colleges of Pharmacy, held in Portland, Maine, last August. Four classes—the same total number of students—half as many graduates each year with twice as much training as under the old two-year course which was given up to a few years ago, seems to sum up the situation. Even now many students avail themselves of the

* Read before Section on Historical Pharmacy, A. PH. A., Rapid City, 1929.

four-year course which is given in most of the colleges and a goodly number are doing postgraduate work.

State Board members, pharmaceutical educators and retail druggists are of the opinion that state prerequisite laws should be consistent with the college requirements for a degree in pharmacy. An important bit of work ahead for pharmacists in each state is to bring about the needed legislation.

Entirely contrary to the reaction which many leaders in pharmacy expected, the retail druggists of the country as a whole, have shown enthusiasm over the four-year college course. At a convention of one of the state pharmaceutical associations which I attended this summer, a resolution was passed seeking the abolishment of the present store apprenticeship as a prerequisite for State Board examination. It was considered that the apprenticeship as required under the present law might or might not be valuable in equipping the embryo pharmacist for his future work. It was quite generally conceded that the experience could in no way be standardized and its value could be determined only upon the inclination of a student's preceptor and whether or not he would be interested in the progress of his apprentice.

As a substitute for the apprenticeship prescribed under the present law, the resolution carried a recommendation that upon graduation from college the applicant be permitted to take his theoretical examination, then serve an interneship of one year in a pharmacy, after which he be permitted to take his practical examination and become a fully registered pharmacist. This means, that after 1932, in order to qualify as a registered pharmacist, the applicant would have to be a graduate from a recognized four-year high school, having completed certain prescribed subjects; a graduate from a four-year college of pharmacy; have passed the State Board's theoretical examination; have served an interneship of one year in a pharmacy and have passed the practical examination given by the State Board.

The National Association of Boards of Pharmacy has steadily carried on its splendidly constructive work in the direction of uniformity for pharmaceutical practice in all states. It can only be predicted that the effectiveness of the N. A. B. P. will show greatly increased benefits from year to year.

The volume of business done in drug stores reaches an astounding figure. Drug stores devoting their energies mainly to merchandising are doing a larger volume than ever before. This is not news. Those stores catering exclusively to professional pharmacy are enjoying an unprecedented success. This is news.

Gradually the ultimate division of stores becomes more apparent. Many prominent leaders in pharmacy predict that the classification of drug stores into two groups, professional and commercial, will come about within a decade after the minimum four-year course in pharmacy is inaugurated at the colleges in 1932.

The number of merchandising drug stores is on the increase. This is also true of the strictly professional pharmacies. Each plays an important rôle in rendering drug store service. The public shows its appreciation of this service by spending more and more in drug stores. It demands the commercial drug stores where it can buy a package of cigarettes, a sandwich and a cup of tea, use the phone booth, pick up a gift for someone's birthday, buy its razor blades and shaving cream, an

electric toaster, postage stamps, poker chips, magazines, a Turkish towel or a pound of coffee. The merchandising drug store will eventually have many items which today would seem entirely out of place in its stock. Many druggists think that in time the merchandising store will voluntarily do away with its prescription department and registered pharmacists.

The ethical pharmacy has a distinct appeal which the public has eventually come to realize, otherwise these pharmacies would not be increasing in number and operating with profit. In proportion to population, the State of Washington leads in the number of splendid, strictly ethical pharmacies. In Seattle and Spokane they are numerous and prosperous. They render a valuable public service. Not only do they fill physicians' prescriptions, but they do laboratory diagnosis as well and sell drugs, medicines, sick room supplies, medicinal household products, physicians' supplies, elastic hosiery, abdominal supports, diabetic foods, biological products—in fact, a great many profitable things in keeping with their type of ethical establishment.

During the past decade organized pharmacy in America has made the most rapid strides in its history. Never before were the AMERICAN PHARMACEUTICAL ASSOCIATION, the National Association of Retail Druggists and the various state and local Associations in as prosperous a condition as to-day. From the standpoint of membership, finances and accomplishments the Associations can well be proud.

The American Pharmacy Headquarters building of the AMERICAN PHARMACEUTICAL ASSOCIATION soon to be erected upon the magnificent site already purchased in Washington, is a fitting monument to the achievements which American pharmacy has attained during the past ten years. In further evidence of the progress of pharmacy in this country I might well point to the flourishing Philadelphia Association of Retail Druggists which owns its imposing headquarters building.

New revisions of the United States Pharmacopœia, the National Formulary and the United States Dispensatory—creditable works—have appeared during the past decade. The A. PH. A. RECIPE BOOK—the first of its kind—has recently been published to fill a long felt want and to further prove the usefulness of this great parent Association. Standard textbooks have been revised and new ones of merit have been written as further evidence that the progress of pharmaceutical literature has kept pace. "Four Thousand Years of Pharmacy," a comprehensive chronicle of pharmacy from its inception to the present day, is a monument to the research on the history, romance, traditions and literature of the profession of pharmacy, accomplished during the past decade. Dr. LaWall has added much to the achievements of this period.

Pharmacists, as never before, have interested themselves in and taken active part in the civic affairs of their communities, states and nation. Pharmaceutical legislation has not been neglected and the more constructive method of public information pertaining to our legislative problems has been adopted.

Publicity pertaining to Pharmacy has, for the first time in the history of American pharmacy, been given serious consideration during the past ten years. Well-organized bodies are carrying on the most important work of disseminating to the public, facts pertaining to the importance of pharmacy and pharmaceutical service.

Pharmacy Week, first suggested at the annual meeting of this ASSOCIATION in 1924, was inaugurated in 1925. It is one of the most valuable accomplishments in the history of American pharmacy. Pharmacy Week has become a powerful influence. The benefits which have been felt as a result of the observance of Pharmacy Week have been manifold. Not only is all organized pharmacy in the United States firmly behind the Pharmacy Week movement but it has spread to Canada, Great Britain, South Africa, Australia, New Zealand and Tasmania. East to the Antipodes—west to the Antipodes—until the message of pharmacy echoes around the entire world, this Pharmacy Week movement is observed in all of the English-speaking countries. Pharmacists in Spain, Germany, France, the West Indies and Central and South America are becoming interested in this great Movement for public understanding of the pharmacist and the rôle which he plays in the interest of public health conservation.

As one single feature of the observance of Pharmacy Week, one newspaper syndicate ran full-page spreads in twenty-eight metropolitan newspapers throughout the nation. These twenty-eight papers have twenty-two million readers who will become pharmacy conscious. When before in the history of American pharmacy has any undertaking, movement or event so forcefully championed the cause of pharmacy?

Such agencies as the Committee on Education and Research of the National Wholesale Druggists' Association, Drug Trade Conference and Drug Trade Bureau of Public Information have contributed much to prove the progress in pharmacy of the past decade.

Surely we can say that pharmaceutical history is being made and in looking ahead in contemplation of the future of our profession, can we not consider it with enthusiastic optimism?

A SURVEY AND CRITICISM OF PRESCRIPTION SYNTHETICS.

BY J. L. KLOTZ.*

The use of the modern synthetics in prescription dates back to the discovery of the therapeutic action of antipyrine by Knorr in 1884. This discovery and those following were, however, presaged by Wöhler's famous synthesis of urea in 1828. At the present time there are several hundred more or less common synthetics in prescription usage, only a small percentage of which are official in the U. S. P. X, although the separate ingredients of many of them are official.

The remarkable success achieved by many of these synthetic drugs is due to several factors, *viz.*: (1) forceful advertising on the part of the manufacturers, (2) constant composition as opposed to deterioration in preparations of crude drugs, (3) certain combinations of therapeutic action can be combined in any one synthetic which would require several different combinations of crude drug preparations to produce the same effect, (4) definiteness of desired action without undesirable bye-effects.

Of the above factors contributing to the success of this type of compound the only one of questionable merit is that of "Forceful advertising by the manufac-

* University of South Carolina, School of Pharmacy.

turer." Although advertising plays an important part in the dissemination of knowledge, it has in this particular field, led to two undesirable situations, *viz.*: Forcing the pharmacist to stock several brands of the same chemical substance to meet the demands of the physicians, and popularizing inferior therapeutic agents.

In order to determine the frequency of synthetics in prescription practice and to find those classes in which the greatest duplication occurs a survey was conducted comprising a total of 3400 non-narcotic prescriptions. A tabulation follows:

Total prescriptions	3400
Total synthetics	1714

Antipyretics.

Name.	Times prescribed.	Per cent of total synthetics.
Phenacetin	194	11.3
Aspirin	152	8.86
Quinine	104	6.00
Salophen	52	3.00
Pyramidon	48	2.80
Antipyrine	24	1.40
Acetanilid	16	0.93
Novaspirin	4	0.22
Phenalgine	2	0.11
Total	596	34.62

Antiseptics and disinfectants.

Phenol	124	7.23
Salicylic acid	34	1.98
Benzoic acid	32	1.86
Resorcin	26	1.50
Aristol	14	0.81
Chlorazene	10	0.58
Betanaphthol	6	0.35
Chinosol	4	0.22
Total	250	14.53

Hypnotics and sedatives.

Luminal	54	3.15
Allonal	30	1.75
Veronal	30	1.75
Chloral hydrate	24	1.40
Dial	14	0.81
Trional	10	0.58
Sulfonal	6	0.35
Paraldehyde	6	0.35
Total	174	10.14

Cardiac stimulants.

Ephedrine	156	9.10
Adrenalin	10	0.58
Total	166	9.68

Anti-rheumatics and uric acid eliminants.

Salicin	60	3.50
Atophan	52	3.00
Methyl salicylate	14	0.81
Piperazine	2	0.11
Total	128	7.42

Intestinal antiseptics and disinfectants.

Camphor	54	3.15
Salol	42	2.45
Total	96	5.60

Diuretics.

Citrated caffeine	68	3.96
Diuretin	14	0.81
Total	82	4.77

Anti-neuralgic (external).

Menthol	56	3.26
Total	56	3.26

Anesthetics (local and general).

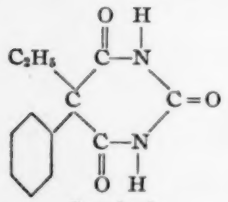
Chloretone	28	1.63
Chloroform	14	0.81
Novocaine	6	0.35
Holocaine	4	0.22
Anæsthesin	4	0.22
Total	56	3.23

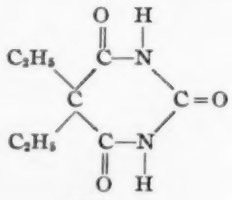
Miscellaneous.

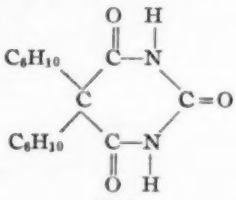
Oxyl iodide	24	1.40
Calcidine	18	1.05
Silosan	14	0.81
Cresatine	12	0.70
Acriflavine	12	0.70
Phenolphthalein	12	0.70
Anasarcin	4	0.22
Tannalbin	4	0.22
Ichthalbin	4	0.22
Theominal	2	0.11
Formamint	2	0.11
Total	108	6.24

From the above results it will be seen that the most popular class of prescription synthetics is that of the antipyretics. Following in the order named are the antiseptics, hyponotics, cardiac stimulants, uric acid eliminants, intestinal antiseptics, diuretics, anti-neuralgics and anæsthetics. The ten most popular individual synthetics in the order named are: Phenacetin, ephedrine, aspirin, phenol, quinine, citrated caffeine, salicin, menthol, luminal and camphor. All groups with the exception of isolated individual instances demonstrate "Definiteness of desired action without undesirable bye-effects," "Valuable combinations of therapeutic action," and "Constant composition as opposed to deterioration," while in most instances a definite relationship can be discerned between "Forceful advertising" and the relative popularity of the synthetic.

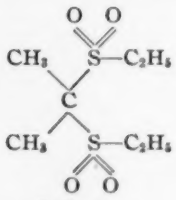
The best examples of the disadvantages attributed to "Forceful advertising" are to be found among the antipyretics and the hypnotics. In these two classes alone, the pharmacist is compelled to stock a total of seventeen compounds, only a third of which are actually necessary to attain any desired therapeutic effect. Chloral hydrate represents nearly 1.5 per cent of all synthetics prescribed despite the fact that it is a gastric irritant and injurious to the heart. Luminal, veronal and dial differ no more in pharmacological action than in chemical structure:

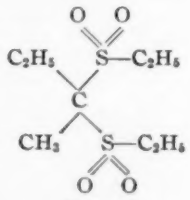

Luminal


Veronal


Dial

Similarly, sulfonal and trional are subject to the same criticism:


Sulfonal


Trional

Aspirin and novaspirin differ principally in the extent of their exploitation and acetanilid represents nearly 1 per cent of all synthetics despite the fact that recent researches[1] have shown it to be quite toxic.

The antiseptics show a heavy preponderance in favor of phenol although Harrington[2] has shown the danger of gangrene formation when it is applied to injured fingers or hands. The popularity of aristol, however, has undoubtedly decreased because of the now generally accepted theory of its low antiseptic power. The absence of the newer compounds such as chloramine-T, etc., although surprising, is probably best explained by the increasing tendency of the laity to purchase highly advertised proprietaries.

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[1] Autenreith, "Detection of Poisons," Ed. VI (1928), page 122.

[2] *American Journal of Medical Science*, CXX, page 1.

In the group of cardiac stimulants the frequency with which ephedrine is prescribed is probably due more to its action on mucous membrane than to its effect on the heart. It has become a very valuable ingredient of nasal sprays and similar preparations intended to allay irritation.

Although camphor leads the group of intestinal antiseptics it is used for so many diverse purposes that salol may in reality be considered the most popular member of this group.

Among the group of diuretics, citrated caffeine owes its popularity largely to its common use along with the antipyretics to aid in elimination. Diuretin, the only other compound of this class commonly prescribed, is very similar in action being a theobromine derivative related closely to caffeine.

Menthol being a compound similar to camphor in respect to its numerous uses renders any attempt to place it in the group of antineuralgics inaccurate. Thus the high percentage of total synthetics which it represents is not a fair indication of the prevalence of this group.

The best examples of synthetics offering specialized therapeutic action are to be found in the group of anæsthetics. Chloretone is an excellent local sedative and anæsthetic for general internal and external use; chloroform is a common agent for the alleviation of bronchial and throat irritation; novocaine offers every advantage in dental anæsthesia; holocaine is an excellent anæsthetic in ophthalmic surgery; and anæsthesin is widely used as a dusting powder for painful wounds. Little or no duplication is to be found in this group which offers a good example of the value of modern synthetics to prescription practice.

There is no apparent reason for the absence of such popular synthetics as urotropin, salvarsan and adalin although the infrequency of synthetic laxatives is best accounted for by the highly advertised proprietaries and the confidence of the public in the old-fashioned preparations.

SUMMARY.

(1) Survey of 3400 prescriptions completed.
(2) Synthetics classified as to frequency of occurrence.
(3) Criticism of duplication of antipyretics and hypnotics.
(4) Advantages and disadvantages of several factors in the success of synthetics discussed.

THE STATUS OF OFFICIAL AND NONOFFICIAL PREPARATIONS IN PRESCRIPTION PRACTICE.

BY WALTER D. STROTHER.*

In 1927 Charters[1] published the results of a survey of pharmacy in the United States. Among many other facts studied and analyzed, he and his co-workers read over seventeen thousand physicians' prescriptions. In this report he gives a complete list of every preparation used in compounding these prescriptions. The survey covered various business centers in the United States so the results represent fairly accurately just what drugs were in use at that time. In addition to the name, the number of times each preparation occurred was tabulated.

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[1] "Basic Material for a Pharmaceutical Curriculum."

In the majority of schools of pharmacy, to my knowledge, no provision is made for teaching the properties and uses of a great many of these preparations found in common use. Some institutions are offering courses which deal with the chemistry and properties of the new synthetics which have promise of becoming useful to the medical profession. It seems to me that in the formulation of the new four-year course which is about to be offered as the minimum requirement for a degree in pharmacy, some provision should be made to include more of the commonly used nonofficial preparations. I have reference not only to the synthetic chemicals but also to preparations composed of ingredients which are recognized as being useful and in common use.

Students, studying pharmacy, frequently ask questions concerning the ingredients and properties of drugs physicians are prescribing. Teachers of materia medica and dispensing pharmacy are the logical ones for these students to go for aid. It is necessary, therefore, for the teacher to keep himself informed regarding the preparations the medical profession has accepted as having virtues worthy of use. Realizing the need of such a list I made a survey of 2500 prescriptions written by physicians in the City of Columbia, and covering the period from January first to November fifteenth of the past year (1930).

I have tabulated below the results of this survey according to the frequency of each class of preparations.

	U. S. P.	N. F.	Non-official.		U. S. P.	N. F.	Non-official.
Acids, organic	190	...	...	Pills	7	5	1
Acids, inorganic	28	1	...	Powders	1	...	...
Waters	45	1	...	Spirits	21	3	...
Elixirs	9	48	81	Syrups	33	10	12
Extracts	5	...	...	Tinctures	195	5	...
Fluidextracts	49	3	2	Synthetic chemicals	239	...	67
Liniments	7	...	...	Other organic chemicals	770	2	2
Liquors	27	5	12	Inorganic chemicals	232	6	26
Lotions	...	11	...	Vegetable drugs	57	...	...
Magmas	3	10	...	Ointments	32	4	7
Masses	1	...	...	Animal products	13	...	...
Mixtures	1	27	1	Unclassified	...	...	646
Mucilages	1	...	...				
Vegetable oils, fixed	1	...	...				
Volatile oils	15	...	1	Total	2002	141	848
Mineral oils	20	...	...	Per cent	66.94	4.71	28.35

We often hear statements made to the effect that doctors are prescribing proprietary remedies much more now than at any time in the past. According to the Charters' survey, 80 per cent of all preparations used in prescriptions were U. S. P. or N. F. The local survey made here closely approximates the figures obtained by Charters. While the figures show an increase in the percentage of proprietaries used now and three years ago, the number surveyed is not as large and, therefore, probably not as accurate as the survey covering the larger number. Nevertheless the results obtained would indicate that physicians are still adhering fairly closely to the U. S. P. and N. F. It will be noted, however, that nonofficial preparations are prescribed about six times as often as those in the National Formulary, but probably do not receive one-sixth as much consideration

as those listed in this book. It would, therefore seem logical, since it is the business of the schools of pharmacy to see that students become familiar with the properties and uses of drugs, that at least the more important nonofficial preparations should be tabulated and studied.

It is true many of the proprietary remedies consist of ingredients that are common and their virtues well known; examples of which are readily recalled by members of the A. PH. A. Pharmacists are frequently heard to complain because they have to carry in stock all these remedies camouflaged under some trade name, when the physician might have just as well written a prescription for the active constituents he desired his patients to have and which the pharmacist already has on his shelves.

The average pharmacist works long hours and finds little time to devote to activities outside of the store. He, therefore, complains of his lot in life and makes little effort to correct it. He has remained faithfully on the premises of his shop, while the manufacturing drug companies have sent out their detail men to persuade the physicians to write prescriptions for their individual products instead of the ingredients used in making the preparations.

Occasionally one reads about some progressive pharmacist who, in planning his work for the week, makes some provision to have one afternoon free to detail the physicians in his town, or if in a large city those who would likely write prescriptions which might find their way to his store. He tells the physician about the official preparations and explains to him the duplication in many of the remedies drug firms are forcing on the market. This type of pharmacist is going to win the confidence of the physician and further he is going to increase his prescription business. If this is true, it has occurred to me that some arrangements could be worked out among pharmacists in their local or state organizations whereby a more general campaign might be made to instruct the physicians as to the contents of the U. S. Pharmacopœia, National Formulary and New and Nonofficial Remedies, with the idea in mind of curbing the prescribing of superfluous nonofficial preparations.

Very recently I was told by a pharmacist that a physician seeing the abbreviation N. F. on a standard remedy, inquired what the letters stood for. Later in conversation with another physician, I learned he also was in ignorance as to the contents of the two standard books published primarily for the pharmacist and the prescribing physician. If this condition is common and the medical schools do not find time to instruct their students as to the contents of the United States Pharmacopœia and National Formulary, then the druggist must make some effort to acquaint the physician with the preparations recognized by his profession as standard. The coöperative doctor should be grateful for this information.

BUSINESS METHODS, WEST INDIES.

Certain trade distinctions drawn in the United States as to the manner in which a firm shall conduct its business do not prevail in many sections of the West Indies. In Curacao a firm importing medicinals can be a manufacturer's representative, agent, importer, wholesaler and retailer at the same time and the carrying of lines of competing medicinals and pharmaceuticals is not considered improper. If an American manufacturer insisted that his Curacao representative do business according to certain American practices, he would experience difficulty in attaining coöperation. (Consul Thomas W. Voetter, Curacao.)

THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

Synthetic remedies are coming into greater use every year and colleges of pharmacy must take cognizance of them if they intend to instruct their students in modern materia medica. The following paper by Prof. A. H. Clark will be of interest to all teachers of pharmacy and pharmaceutical chemistry because it treats upon the important subject of synthetic remedies.—C. B. JORDAN, *Editor*.

SYNTHETIC REMEDIES. THEIR PLACE IN THE CURRICULUM OF A SCHOOL OF PHARMACY.

BY A. H. CLARK.*

It is the writer's opinion that the curriculum of a school of pharmacy should give to the student of pharmacy that which will make his service to the public safe and efficient. He should also have a general education in keeping with his standing as a professional man, and other qualifications in keeping with the special privileges he enjoys as one engaged in a hazardous occupation. He should also be able to use the knowledge, scientific and otherwise, which he acquires in college, to increase his income.

For many years synthetic remedies have been increasing in numbers and importance until to-day they are one of the greatest factors in scientific pharmacy. Their wide use, vast numbers, diversity of character both chemically and physiologically, etc., make their study vastly important. In order that a pharmacist's service to the public should be safe and efficient a knowledge of these synthetics is very essential. A study of them greatly increases his general knowledge of organic chemistry and adds vastly to his prestige as a professional man. This is true of his relationships to other professional men, in particular the physician. Such knowledge is bound to increase his income indirectly if not directly.

The study of synthetic remedies might be undertaken from any one or all of a number of viewpoints. Chemical constitution, methods of manufacture, physiological action, tests of identity and purity, chemical behavior, etc., are some of the things to consider in their study. The teacher must choose the viewpoint which he thinks the best adapted to the needs of his particular students. Methods of manufacture are very valuable because of the general knowledge of organic reactions involved. To the student of chemical engineering these are absolutely essential. To the student of medicine or the physiological chemist their action on man and animals is the most important. To the analytical or control chemist their chemical behavior is of the greatest importance. Since it is obviously impossible to consider all these various phases of the subject at once and thoroughly the writer has come to the conclusion that a study of the chemical constitution of these synthetics comes nearer than any other thing to giving the student of pharmacy what he needs.

If a student is well grounded in the important or significant behavior of the various groups and radicals which are present in an organic substance he knows very well what it will do from a chemical standpoint. He also knows much about its

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physiological action, although the writer holds that a pharmacist should not pretend to specific knowledge regarding the physiological action of drugs. A general knowledge, for example, of the physiological effect of local anesthetics, of the barbital derivatives, of the arsenic compounds, etc., is as far as he should pretend to go. To the average student of pharmacy a knowledge of all the reactions in the synthesis of, for example, antipyrine, phenacetine, stovaine, etc., is also not at all necessary. His course in organic preparations should include some of this kind of work, since it adds to his general training. The average student should know about the U. S. P. tests of purity and identity in so far as it is possible to give him these in a laboratory course. The structure alone will tell by far the larger part of the story in the above cases.

As far as the study of synthetics in a course in general or theoretical organic chemistry is concerned, then, a knowledge of structure is of prime importance. The question arises as to the best method of giving such a course. Many teachers would be inclined to consider synthetic remedies along with all the other organic compounds of any particular class to which the synthetic belongs. This manner of presentation scatters the study of synthetics over the entire field of organic chemistry with the result that their importance is entirely lost sight of and the knowledge gained early in a course is forgotten long before the course is completed. Furthermore, many of them are so complex that an understanding of their entire structure is impossible without a knowledge of the entire field of structural organic chemistry.

For the reasons given above the writer believes, and this belief is founded on many years of experience, that the best results are obtained by making the study of synthetics a separate and distinct course. It is also of great advantage to classify them according to chemical constitution, although this presents some difficulties. For the student of pharmacy, however, it is far better than a classification based upon physiological action, although the latter might be better for the student of medicine. One of the great advantages with this arrangement lies in the fact that, if a course in synthetics is given toward the end of a student's college work, and the classification outlined above is followed, it affords the best means for a general review of the entire field of theoretical organic chemistry that the writer knows of, and has the advantage over the usual tiresome reviews of combining something new with it. If, as has been already said, a good course in theoretical organic chemistry has been given, every principle and every class reaction embodied in such a course will be reviewed as the structure of these synthetics is studied. Since many of these synthetics are named according to the accepted systems of nomenclature, it is very important that a student be well drilled in the various schemes of naming organic compounds. Frequently the name indicates the structure, and always the structure shows the component parts of the molecule, and each one of these parts indicate certain properties and, therefore, the structure tells the entire story more fully than anything else can.

This scheme for the study of synthetic remedies consists, then, of presenting a course in theoretical organic chemistry in which the properties of each class of compounds is presented in a thorough manner and from the standpoint of the influence of structure on their properties. A thorough understanding of nomenclature should be acquired by the student as the course proceeds. After this

ground has been covered the synthetics are then grouped in exactly the same order as the other organic compounds have been, and their properties and uses studied from the standpoint of the general knowledge already obtained of the behavior of organic radicals. No better or more profitable review of the entire field of organic chemistry could be conducted than this scheme affords. Furthermore, the opportunities afforded the teacher for enlargement of the subject, such as the discussion of the history, commercial preparation, relationship of chemical constitution to physiological action, etc., is unlimited and the entire subject can be made most interesting and profitable to the student. The knowledge gained in such a course will surely further, to a high degree, the aims of a curriculum of a school of pharmacy as outlined in the opening paragraph of this paper.

A brief outline of a course such as advocated above and amounting to two semester hours of credit or about 32 clock hours of lectures and recitations would be something like the following:

Hydrocarbons used in pharmacy and medicine would include as much of a general discussion as the teacher desired to include. Some of the specific articles considered might be the following: benzin, kerosene, the liquid petrolatums, semi-solid petrolatums, ambrine and like substances, ethylene, acetylene, benzene and all the ichthyol-like substances.

Halogen derivatives might well include all the substitutes for the inorganic hypochlorites such as the chloramines. The various chlorine compounds used as solvents and anesthetics. The chloral substitutes. The brominated and iodized fats, oils, proteins, etc. The various forms of iodine medication both internal and external. Iodoform and its substitutes. Thymoliodide and similar products.

Phenolic substances used as antiseptics and germicides. Guaiacol, creosote, betanaphthol, etc., and their modifications.

The various alcohols such as amyl alcohol and derivatives. Methyl and ethyl alcohol and their physiological action. Benzyl and salicyl alcohol.

Aldehydes would include formaldehyde and its modifications. These afford a very interesting field of study.

Ketones would include camphor and its substitutes, which are rapidly growing in importance and interest.

Of the acids, salicylic acid and its modifications are so numerous and varied that there is almost no limit to the time that might be devoted to their consideration. Some of the most important medicaments in use will be found in this group. Esters of it, aspirin and its modifications, the amino derivatives, etc., are examples.

Esters such as the nitrites of the various alcohols, benzyl alcohol esters, amyl alcohol esters, the esters of borneol, santalol, etc., ethyl chaulmoograte, tannic acid esters and many others offer an interesting field for review and the study of the action of alcohols on the body.

Among the amines and amides are some very important medicaments. Acetanilid and phenacetine and their modifications are a wonderful field. The urethanes are scarcely less important. The consideration of the barbituric acid derivatives could alone be made a semester's work.

The quinolin and anthraquinone derivatives—including as they do cinchophen and related substances, chinosol, iodoxy-quinolin compounds, emodin and similar bodies—are of extreme importance.

The consideration of dyes as medicaments could be extended without limit by introducing the general discussion of dyes at this point in the course. The time at the teacher's disposal is the only limiting factor to this subject. What could be more desirable to the pharmacist than a general knowledge of indicators, for example? The wide use of certain halogen derivatives of phenolphthalein as diagnostic reagents should be familiar to every pharmacist. The antiseptic value of the acridine dyes, as well as of others, should be known. In a general way the structure of dyes should be discussed along with the above.

As organo-metallic compounds the vast importance of the arsenicals and mercurials cannot be overestimated. The pharmacist should certainly know something about these. The field is unlimited. Other organo-metallic compounds, notably the silver protein compounds, should not be overlooked in this classification.

SUGGESTION TO OUTSIDE LECTURERS—COURSE: BUSINESS ECONOMICS.

BY W. BRUCE PHILIP.*

The suggestions which follow have been prepared at the request of persons who were asked to address the classes of the College of Pharmacy and who have had little or no experience in this kind of talking. "If you will forget that you are delivering a lecture and talk to the class, you will make your lecture hour a success.

"Lectures are scheduled for 45 minutes; therefore, try and stick to your subject. Knowledge is one of the fundamentals of salesmanship. You are requested to address this class because you have special knowledge of the merchandise that your firm manufactures or sells. Therefore, try in the time allotted, to give all the information you can that deals directly with your line of merchandise. Discuss, very briefly, other kinds of merchandise, as allied lines, for time thus taken shortens your opportunity to discuss your own line. If you wish to make a historical background of your product or describe how your merchandise fits into the drug store, I suggest you use for this part of your talk not over 10 minutes. If you have samples of your merchandise to show the class, try to have these arranged on your desk ready for display before you start talking. Hold each article up and forward so that all members of the class can see; turn each sample around slowly so that all sides can be seen; name the article—common trade name and size—*twice*—once when you show the article and repeat as you replace the article on the desk. If it is desirable to take a bottle out of the carton, do not take the time to replace until after the lecture—leave it on the desk until then.

"(1) Divide your time between the gathering of the crude drug or material.
"(2) Manufacture of products for sale.
"(3) Distribution of product and drug store display.
"(4) Selling of your line of articles only.

"If you use a trade or unusual name, repeat the name and spell slowly. If desirable, define the word.

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* California College of Pharmacy.

"Under No. 1, give country where the crude product comes from· grades, kinds, part selected, and why; what becomes of inferior grades in commerce; briefly trace the products to your factory.

"Under No. 2, give process, using trade names wherever possible; mention commercial by-products of value, briefly telling of those of pharmaceutical interest.

"Briefly describe your testing laboratory, if you have any, and give the number of pharmacists or pharmaceutical chemists in charge; describe finished product—grades, kind, color, style; briefly show change or advancement during the last five or ten years.

"Under No. 3, state amount of product produced; how distributed, packed, labeled and sold to drug store owners; proportion by percentage the amount of your item sold against the total drug store merchandise, and the opportunity for the druggist to increase the sale of your product in his drug store.

"Under No. 4, state how to display and sell your line; selling talk; please make this talk explanatory—how to sell your line—not a general salesmanship talk.

"*Stories.*—Stories always help to make a lecture interesting. Positively no off-color or nearly-so stories can be told in a university lecture.

"The instructor will sit in the back of the room and raise his hand if he cannot be heard. Speak clearly, using simple words and hold your head up as much as possible. You will be introduced by giving your name and title and the name of your firm and the products your firm manufactures. You and your firm will be thanked at the end of the lecture. Try to avoid using your firm name during the lecture.

"I would like to thank your firm for the privilege of having you address the class, so leave with me the correct name, title of person and address to whom the letter is to be mailed."

IMPORTS OF SULPHUR AND SULPHURIC ACID IN COLOMBIA.

The imports of sulphur in Colombia during 1928 were 128 metric tons valued at $11,222, compared with 137 metric tons valued at $10,653 in 1927. Of these imports the United States supplies approximately 75 per cent while Germany and the Netherlands were the other chief suppliers. The imports of sulphuric acid during 1928 were 118 metric tons, the United States, Germany and the Netherlands being the chief sources. (Assistant Trade Commissioner James J. O'Neil, Bogota.)

Texas produced nearly all of the sulphur of the United States in 1930 and probably between 80 and 90 per cent of the world's output. The value is reported as upward of $30,000,000. The value of the production of the preceding year, 1929, was placed by the State Comptroller at $30,841,065.

During the year 1930 the three sulphur-producing companies—the Texas Gulf, the Freeport Sulphur and the Duval Texas Sulphur Companies—produced a total of 2,560,197 tons of sulphur, according to the report of the State Comptroller. This represented an increase of 202,563 tons when compared to the output of 2,357,634 tons in 1929.

UNITED STATES CRUDE DRUG FOREIGN SALES 1930.

Exports of ginseng and other crude botanical drugs from the United States during 1930 were valued at $2,577,000, as against $3,690,000 for the preceding year. The 1930 trade was divided—$1,877,000 for ginseng and $700,000 for other American crude vegetable drugs. The lower figure was due not so much to a decreased demand, as to the lower prices that prevailed during 1930. The quantity of ginseng exported was approximately 30,000 pounds less and there were actually exported 256,000 more pounds of other American crude vegetable drugs.

THE DEPARTMENT OF THE NATIONAL ASSOCIATION OF BOARDS OF PHARMACY

President, W. M. Hankins, Daytona, Fla. J. W. Gayle, *Treasurer*, Frankfort, Ky. Chairman of Executive Committee, A. C. Taylor, Washington, D. C. *Secretary*, H. C. Christensen, 130 N. Wells St., Chicago, Ill.

ACTIVE MEMBER STATES.

Alabama	Indiana	Montana	Rhode Island
Alaska	Iowa	Nebraska	South Carolina
Arizona	Kansas	Nevada	South Dakota
Arkansas	Kentucky	New Hampshire	Tennessee
Colorado	Louisiana	New Jersey	Texas
Connecticut	Maine	New Mexico	Utah
Delaware	Maryland	North Carolina	Vermont
D. of Columbia	Massachusetts	North Dakota	Virginia
Florida	Michigan	Ohio	Washington
Georgia	Minnesota	Oklahoma	West Virginia
Idaho	Mississippi	Oregon	Wisconsin
Illinois	Missouri	Pennsylvania	Wyoming
		Porto Rico	

DISTRICT NO. 1 MEETS.

By holding the first district meeting of the convention year, this district is living up to its name, or perhaps we should say number. Vermont, Connecticut, Massachusetts, Maine, New Hampshire and Rhode Island comprise the district. Vice-President C. T. Gilbert (Connecticut) of the N. A. B. P. presided at the meeting which was held at the Massachusetts College of Pharmacy in Boston on December 3 and 4, 1930. The college and board delegates who gathered spent most of the time in round-table discussion of examination methods and mutual problems, and those who attended feel that they gained a great deal of helpful information.

A NEW METHOD OF AWARDING CERTIFICATES.

The New Jersey Board of Pharmacy, instead of mailing licenses to applicants who passed a recent examination, held what might be termed formal "graduation" exercises at the State House in Trenton on December 2nd, when certificates of registration as pharmacists were awarded. The value of this procedure in impressing upon the neophyte his obligation and responsibility cannot be overestimated.

A printed program gave the list of those receiving licenses and contained the code of ethics of the AMERICAN PHARMACEUTICAL ASSOCIATION, which each new pharmacist signed and pledged to uphold. The certificates were presented by Acting Governor Arthur N. Pierson; there were short addresses by President C. Graham McCloskey and Secretary Robert P. Fischelis of the New Jersey Board, also Secretary H. C. Christensen of the National Association Boards of Pharmacy.

While the plan is not practicable in large states where the applicant would be put to considerable expense and loss of time in making a long trip to get his license, in those states where the territory is restricted, as in New Jersey, the plan is worthy of consideration for its beneficial effect on the morale of the profession.

DR. JAMES H. BEAL ON EXAMINATIONS.

"Examinations as a Factor in Pharmaceutical Progress" is the title of a most interesting article by Dr. James H. Beal in the December 1930 issue of *The Druggists Circular*. The subject matter applies directly to the work of pharmacy examining boards, making it of vital interest to N. A. B. P. members. On commenting on the work of our Association, he says:

"Of late years, under the leadership and stimulating influence of the National Association of Boards of Pharmacy, improvement in examination methods has been especially rapid. The examinations conducted by some present boards would rank high on any scale of pedagogic rating, and practically all boards are making commendable progress."

To those who point out that the pharmacist is engaged primarily in commercial enterprise after licensing and should, therefore, not be required to qualify on a high educational standard and a thorough-going board examination, he replies: "The candidate is not asking authority to engage in a purely commercial business, but is seeking a certificate which will authorize him to compound and dispense drugs, medicines and poisons and cannot, therefore, legitimately object to being called upon to demonstrate the proficiency which such certificate declares him to possess. . . As long as the druggist claims the right to exercise all of the prerogatives of the dispensing pharmacist he cannot consistently object to the requirement that he demonstrate his qualifications to do so."

STATE BOARD NEWS.

Alabama.—A revised and improved pharmacy bill, strengthening the enforcement features of the law, will be introduced in the legislature now in session.

The next meeting of the Board will be held on June 8th at Montgomery, Ala., just prior to the annual meeting of the state pharmaceutical association, which opens on the 10th.

J. T. Dumas, president of the Board, is now traveling in addition to keeping supervision over his pharmacy, ably assisted by his wife and daughter.

Arizona.—The 54th semi-annual meeting of the Board was held at Phoenix on Nov. 12th. H. Boyd Laird of Globe was elected president, and Fred W. Moore of Flagstaff was made vice-president of the Board.

The following resolution was unanimously adopted: That beginning with the November 1930 examination and in the future, candidates for registration as Registered Assistant Pharmacists, excepting those who had made application as Registered Assistant Pharmacists previous to November 12, 1930, shall be required to make a grade of at least 60% on each subject, and a general average of 75% in all subjects given as part of the examination."

Thirteen reciprocal licenses were issued, the applicants coming from Texas, Ohio, Kentucky, Missouri, Kansas, Maryland, Iowa and Colorado.

Colorado.—While 122 applications to take the December examination of the Board were received, only 112 answered roll call. The results will be announced later, as board members have not had the leisure time to grade all of these papers.

Reciprocal registration was extended to two applicants, one from Missouri, another from Minnesota.

The Board office is temporarily located in the office of the Plumbing Inspector, 436 State Office Bldg., as the legislature is in session and the regular office of the Board in the Capitol is in use.

Florida.—The Board met in Gainesville on January 12th–13th. Thirty-eight candidates were examined, fifteen passing. Thirty-one were registered by reciprocity.

The following officers were elected for the ensuing year: *President*, N. H. Hunter, Ft. Myers; *Vice-President*, John K. Clemmer, Miami; *Secretary-Treasurer*, J. H. Haughton, Palatka.

Iowa.—The Pharmacy Examiners are conducting an investigation of the sale of stock food and veterinary remedies to farmers. Many of these contain drugs and medicines whose sale is restricted by law. Vendors of such products are liable under the law for a vendor's license fee. A test case may be taken to court later.

Kansas.—Again consolidation of professional boards threatens. A similar effort two years ago was blocked. Economy, as usual, is made the basis for the plea. The *Midwestern Druggist* points out that the examining expense will be the same under consolidation as at present, as obviously there must be examiners, with the exception that the secretary's salary of $50 per month will be saved—$600 per year. However, the new department is to have a director whose annual salary is $25,000, which is many times in excess of what all the professions combined are paying for individual executives. Thus, the object of the bill is the creation of a political plum. Another bill is also pending, which appropriates one million dollars to purchase an office building for the new consolidation department and the highway commission—another reckless extravagance.

Kentucky.—At the quarterly meeting held in Lexington on January 13th, R. Lee Cassell of that city qualified as the newly appointed member of the Board to succeed Linwood A. Brown, whose term expired.

George E. Porter of Berea was elected president of the Board for the ensuing year.

At this meeting, ten applicants for registered pharmacist and twelve for assistant were examined. Three of the first class passed and four of the second.

The annual report of the Board which is now in press will show that during the year about ten injunction suits were successfully prosecuted against drug firms who failed to keep a registered pharmacist in charge of their stores.

The next meeting will be held in Louisville, April 14th.

Maine.—An examination was held on December 10th, eight applicants participating, but none was able to make a rank sufficient to secure a certificate.

The term of Roy M. Hescock of Monson expired on December 1st and he was ineligible for reappointment under the law. The Governor has appointed Alfred P. Manson of Gardiner as his successor. The pharmacists are happy over the choice as Mr. Manson was their selection.

Massachusetts.—A class of 58 was examined on December 16th, and 22 were successful in receiving licenses.

Michigan.—Orville D. Hoxie of Grand Rapids was elected president of the Board at the recent meeting held at the College of the City of Detroit. Examination results were not available at time of going to press.

J. Edward Richardson of Detroit was endorsed by the Detroit Branch of the A. PH. A. for reappointment to the Michigan Board, and a recommendation to that effect was made to Governor-Elect Wilbur.

Minnesota.—The Board examined 26 candidates at the January 15th examination, of which number 50% were graduates, the other candidates being exempted under the law. Total number passing—16.

Three applicants were registered by reciprocity, one each from Texas, Iowa and Missouri.

At the annual meeting held at the same time, John Nelson of Lake Park was elected president for the ensuing year, and John W. Dargavel of Minneapolis was reëlected secretary.

Missouri.—An examination meeting was held at Macon, on January 12th and 13th. Forty-seven candidates for R.Ph. license and forty-two for assistant grade took examination.

New Hampshire reports legislative activity but no report on the content of the bills proposed is available.

New Jersey.—An examination meeting was held at the State House in Trenton on Jan. 15th and 16th, with 32 applicants presenting themselves for the assistant pharmacist certificate and 163 applicants for the registered pharmacist certificate.

A proposed bill to provide for consolidation of the professional boards was roundly condemned by the Governor in his annual message to the Legislature. As a result, the administration which is in control of the Legislature will not attempt such a bill at this session. The combined efforts of the professions in fighting the measure have borne fruit.

North Carolina.—The North Carolina Board celebrates its fiftieth birthday or golden anniversary on May 17, 1931, having been organized May 17, 1881.

C. P. Greyer of Morganton, who has served as a member for 15 years, will retire on April 28th, to be succeeded by W. Lee Moose of Albemarle.

Ohio.—The Ohio Board, in a letter addressed to the State pharmaceutical association, sets forth its position with regard to a drug store permit law. Evidently there has been some feeling to the effect that if a permit law is passed, annual registration of individual licenses should be discontinued. Quoting from the report:

> "It is our opinion that some sort of renewal of certificates should be retained, therefore, we recommend the continuance of triennial registration of pharmacist and assistant pharmacist certificates at the same fee and the annual registration of drug stores at one dollar per year and also the annual registration of all places handling drugs and medicines that are exempt from the pharmacy law, at an annual fee of three dollars. It is understood that the board does not approve of the above unless all places selling drugs and medicines in the state are required to register and have a license to handle same."

Oregon.—M. C. Kaegi of Portland was appointed on December 9th by Governor Norblad as a member of the Oregon Board to succeed A. E. Crosby of the Dalles, who resigned recently. Mr. Kaegi is a graduate of Oregon State School of Pharmacy, 1920.

South Carolina.—Out of 21 applicants taking the November examinations at Newberry, seven were successful.

The next regular meeting will be held at Columbia, March 18th and 19th. Election of officers will take place, as well as examination of applicants.

Vermont.—Mason G. Beebe, a former member of the Vermont Board, was found dead in bed on December 26th. Mr. Beebe enjoyed one of the best prescription businesses in the state; he leaves one son.

Wm. B. Shangraw of Rutland has been appointed to fill the vacancy on the Board owing to the death of Ralph C. Root of Brattleboro.

West Virginia.—The new West Virginia Code, effective January 1, 1931 provides that all certificates shall be renewed on July 1st, biennially; fee $2.00 as heretofore. The examination, fee is $20 instead of $10 and there is an additional fee of $5 for issuing certificate (or duplicate at any time). Fee for assistant examination is $10 plus $5 certificate fee. Total reciprocity fee is $25 including certificate.

Wisconsin.—The pharmacy board concluded its quarterly examination at Madison on January 24th, registering 64 out of 158 candidates examined. Forty-four received R.Ph. licenses and twenty A.Ph. certificates.

Wyoming.—Fourteen applicants were examined at the meeting held January 19th and 20th at Cheyenne, six of them passing.

J. EDWARD RICHARDSON, RETIRING MEMBER MICHIGAN BOARD OF PHARMACY, PRESENTED WITH SILVER SET.

The presentation was made at a luncheon held in Webster hall, Detroit, Tuesday, January 20th, by President Orville Hoxie for the board of pharmacy. Mr. Hoxie, as well as the other members present, complimented Mr. Richardson for the splendid service he had rendered Michigan and pharmacy. Besides the board members and deans of colleges of pharmacy in Michigan, the Detroit Retail Druggists' association was represented by Messrs. Leonard A. Seltzer, J. H. Webster, F. C. Bellemore and President Bernard A. Bialk.

KENTUCKY SALES TAX CONSTITUTIONAL.

The Franklin Circuit court recently held the Kentucky graduated sales tax on retail merchants constitutional. The sales tax is not a license tax, but a sales or consumers' tax; the Kentucky Court of Appeals has upheld the right of the state to tax merchants on the basis of their sales, or on the amount of business transacted.

PROCEEDINGS OF THE LOCAL BRANCHES

"All papers presented to the Association and Branches shall become the property of the Association with the understanding that they are not to be published in any other publication prior to their publication in those of the Association, except with the consent of the Council." —Part of Chapter VI, Article VI of the By-Laws.

Article III of Chapter VII reads: "The objects and aims of local branches of this Association shall be the same as set forth in ARTICLE I of the Constitution of this body, *and the acts of local branches shall in no way commit or bind this Association, and can only serve as recommendations to it.* And no local branch shall enact any article of Constitution or By-Law to conflict with the Constitution or By-Laws of this Association."

ARTICLE IV of Chapter VII reads: "Each local branch having not less than 50 dues-paid members of the Association, holding not less than six meetings annually with an attendance of not less than 9 members at each meeting, and the proceedings of which shall have been submitted to the JOURNAL for publication, may elect one representative to the House of Delegates."

Reports of the meeting of the Local Branches shall be mailed to the Editor on the day following the meeting, if possible. Minutes should be typewritten with wide spaces between the lines. Care should be taken to give proper names correctly and manuscript should be signed by the reporter.

DETROIT.

The January meeting of the Detroit Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held in the Y. M. C. A. building, Thursday evening, January 15, 1931. A goodly number of students swelled the attendance. Dean Kraus and Professor Glover represented the University of Michigan.

Fred Ingram, Jr., presiding, called the meeting to order. The minutes of the previous meeting were read and approved. Mr. Ingram introduced as the speaker of the evening Ernest B. Crandall, a professor in pharmacy at the College of the City of Detroit. He presented a most interesting paper on the "Exactness of Expression in the U. S. P.," wherein he brought out many examples of "when the U. S. P. says what it does not mean"—and showed how by adding or omitting a word, in many cases, the entire meaning is changed. In some cases he found it necessary to substitute a word to bring out the exact meaning of the U. S. P. He referred to various pages in the U. S. P. for substantiating his claim.

A general discussion followed, which proved most interesting.

L. A. Seltzer requested that Prof. Crandall's paper be published and copies sent to E. Fullerton Cook and other members of the Committee of Revision.

Dean Kraus said, "Professor Crandall has done splendid work in calling attention to inconsistencies in the U. S. P."

Mr. Ingram thanked the speaker for his paper, which he presented to the Branch for publication.

Dr. Seltzer suggested that the meeting night be changed so that attendance might be increased. It has been observed that Thursday night conflicts with several other activities—many of the Branch members finding it necessary to divide their time. On motion of Leo J. LaCroix and supported by L A. Seltzer it was voted to hold future meetings on Tuesday evening, instead of Thursday.

Chairman Burniac, of the Membership Committee, continued his good work by bringing in two applications accompanied by checks for one year's dues. He also suggested supplying members with a certificate that might be displayed and also an emblem which would associate the member's store with the AMERICAN PHARMACEUTICAL ASSOCIATION and thus encourage the coöperation of physicians—to work out this plan Mr. Ingram appointed a Committee of the following members: J. J. Burniac, *Chairman;* Leonard A. Seltzer, Bernard A. Bialk and Fred Ingram, Jr.

BERNARD A. BIALK, *Secretary.*

NEW YORK.

The January meeting of the New York Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held at the College of Pharmacy, Columbia University, on Monday the 12th, President Robert R. Gerstner, presiding.

The minutes of the December meeting were read and approved.

Chairman Lehman of the Committee on Education and Legislation, reported that no action had been taken on the Capper-Kelly Bill as yet; he said that there were rumors

that a bill would be introduced in the State Legislature forbidding the handling of food in establishments which dispense poisons.

Dr. Mayer, for the Audit Committee, reported that he had approved of the bills which had been submitted to him, but had not as yet audited the Treasurer's books.

Dean Dandreau, chairman of the Membership Committee, submitted 91 applications from students of the St. John's College, School of Pharmacy, for Student Membership in the Branch.

The secretary reported that he had received applications for full membership of the Branch from the following: Messrs. Harold Baylies, David Bisen, Murray Breese, John J. Corcoran, Alfred D'Annunzio, John D. Earle, Victor H. Edelstein, Isidor B. Facton, Benjamin E. Holsendorf, Sidney J. Jackson, Frederick Kleinschmidt, Robert Lang, Victor Lewitus, Milton S. Malakoff, Rubin R. Miller, Vincent A. Musetto, Louis B. Ortega, Joseph Personeni, Salvatore Trischitti, Joseph H. Velsor, George J. Wallau, Russel Winer, B. T. Woodward, J. W. Wupperman. All of these applications were voted on and approved.

Dr. Mayer submitted the application of Miss Bessie Mitchell and the secretary submitted that of Dr. A. Lichterman for membership in the parent organization.

Under the heading of New Business, Dr. Schaefer made a motion that a committee of three be appointed to consider the advisability of the Branch joining the New York Pharmaceutical Conference; the motion was seconded and approved. The president appointed Messrs. Schaefer and Lascoff and Timmermann as the Committee.

The president asked for a report from the Committee on Nominations; Chairman Schaefer submitted the following list of nominations:

President, Robert P. Fischelis; *Vice-President*, Ernest A. Bilhuber; *Secretary*, Herbert C. Kassner; *Treasurer*, Turner F. Currens; *Delegate to House of Delegates and Secretary of Remington Medal Committee*, Hugo H. Schaefer.

Chairmen of Committees, Education and Legislation, Robert S. Lehman; *Progress of Pharmacy*, Lewis N. Brown; *Professional Relations*, Jacob Diner; *Audit*, Joseph L. Mayer; *Membership*, John L. Dandreau.

Dr. Arny moved that the report be accepted and that the retiring chairman cast one ballot for electing the officers; the motion was approved.

The president then installed the new officers and welcomed the president-elect to the platform.

Chairman Dyer, of the Committee on the Progress of Pharmacy, brought to the notice of the meeting certain new remedies, *e. g.*, Angioxyl, Antihyperton, Calminal, Catronal and Eukutol. He read abstracts on the "Estimation of Alcohol," and the "Quality of Commercial Ether."

President Gerstner introduced Mr. Thomas Lewis as the speaker of the evening, saying that he was formerly Head of the Welsh College of Pharmacy and served for some years as a member of the board of Examiners of the Pharmaceutical Society of Great Britain, and is now the chief chemist of S. B. Penick and Co.; the president said, Mr. Lewis would speak on "The Practice of Pharmacy in Great Britain."

Mr. Lewis then addressed the meeting as follows: "It is very gratifying to me to be here this evening to talk on the practice of pharmacy in Great Britain and there is an added pleasure in the knowledge that your Secretary, Dr. Kassner, was at one time a Research Worker in the London laboratories of the Pharmaceutical Society of Great Britain.

"In general the careers of all those engaged in our profession in Britain commence in the Chemist's Shop and the bulk of the registered pharmacists remain in the retail drug business. We call all our stores 'shops,' hence the British equivalent of the American drug store is the chemist's shop, a title which still sticks in the public mind in spite of attempts to speak of them as 'pharmacies.' It is interesting to note that the title of chemist and druggist is legally restricted to use by the registered pharmacist only, a condition which is much resented by the academic, industrial and analytical chemists. As I said, the average British pharmacist occupies a distinct position in the life of the country and enjoys considerable prestige, there existing a valuable personal contact between him and his customers.

"You are all more or less familiar with the term 'life history' as applied to the fern, but I think that the 'Life History of a British Retail Pharmacist' will interest you more this evening and it is of this I now propose to speak.

"The Pharmaceutical Society of Great Britain has had allocated to it by the British Government the control of pharmacy and the retailing of poisons in that country and amongst

its activities is the laying down of regulations for shop training, education, examination and registration of the pharmacist.

"The individual about to enter pharmacy must satisfy the Society as to his preliminary education, and this is controlled by specifying the examinations of different educational bodies which will satisfy the requirements. This being assured, registration as a student with the Pharmaceutical Society is the first step and subsequent to this the student must spend a period of not less than two years as an apprentice to a registered pharmacist, also a period of not less than two years at a recognized College of Pharmacy before presenting himself for his qualifying examination, which is taken in two parts. The first part, called the Preliminary Scientific Examination, in chemistry, botany and physics, is taken at any time during the four years spoken of, as long as a course of one academic year has been followed at an approved college. Before sitting for the second or final examination he must have completed the full training, must be 21 years of age and must have followed a further one year of academic work since the date of his passing the Preliminary Scientific or First Examination. It will be noted that because of this last proviso the course may conceivably extend much beyond the four years, if there is any failure in the Preliminary Scientific Examination. On passing the Qualifying Examination the student is automatically registered as a Chemist and Druggist and can thereafter occupy any position open to the qualified individual.

"The Pharmaceutical Society conducts a higher examination which necessitates a longer training and the passing of which entitles the student to call himself a Pharmaceutical Chemist. Several British Universities grant the Degree of Bachelor of Pharmacy, but this in itself is not a qualification to practice pharmacy, the qualifications of the Pharmaceutical Society being the only ones so recognized by the law of Britain. Many of those taking the degree or the qualification of Pharmaceutical Chemist do not return to the retail but proceed to academic, research or manufacturing work.

"So much for the training of the pharmacist, and I now propose to give you a picture of the average chemist's shop.

"One of the most striking features is the retention of the carboys of colored water in the windows; another is that when you enter the shop, you notice first the display of chemicals and drugs in bottles called shop-rounds on the shelves facing the customer, also of crude drugs in labeled shop drawers, and the impression is at once conveyed that this is a store of which the primary object is the sale of medicines. Secondary to this is the toilet articles' side, including perfumes, powders, sponges, toothbrushes, etc. The sale of cameras and other photographic goods is looked upon as the rightful duty of the pharmacist, and in addition many pharmacists practice sight-testing and supply spectacles. The lunch-counter is not seen in the individual pharmacy but the chain stores have restaurants in their larger shops; but even in these they constitute a separate part of the building.

"We have chain stores in Britain, the largest having about 1000 branches and they differ from the ordinary pharmacy in that they have departments for the sale of fancy goods, hand bags, pictures and silverware; they also have lending libraries and in most of them cafés as well.

"These chain stores have a decided following but taking all in all the private pharmacist is well able to hold his own, this being due in no small measure to the P. A. T. A., which secures that no price cutting takes place in any pharmacy, whether chain store or otherwise, in the case of advertised specialities such as patent medicines.

"The P. A. T. A. or Proprietary Articles Trade Association is made up of retailers, jobbers and manufacturers, and practically every manufacturer of repute is a member; such is the situation that specialities whether perfumes, surgical appliances or patent medicines made by these manufacturers are listed with a minimum retail selling price and cannot be bought under this price in any store. There is no law in Great Britain to prevent the fixing of a price by the manufacturer; on the other hand there is no law preventing the pharmacist selling under the fixed price, but his difficulty will be the obtaining of further supplies from jobber or manufacturer once it has been established that he is cutting prices. The proposed Capper-Kelly Bill will, if passed, prevent price cutting by law in the U. S. A.

"The P. A. T. A. works closely with the Retail Pharmacists' Union of Britain, an association established some years ago to deal with the trade side of pharmacy, which the Pharmaceutical Society is prevented from doing by its charter. This body, of which practically

every retail pharmacist is a member, enables the trade to deal collectively with government departments upon such things as the charges to be made for medicines, etc., supplied under the National Health Insurance Act. Also it supplies legal assistance and insurance to its members and does quite a number of other useful things which the individual pharmacist would find difficult.

"I have mentioned the National Health Insurance Act and would like to give some idea of this. It was instituted in Britain in 1911 and under it all persons in employment not earning more than a certain wage must be insured against sickness. Each week both the employer and employee pay a certain fixed sum into the Insurance Fund by means of affixing a stamp to a card supplied to each employee by the Government Department concerned; the employer deducts each week a sum (I believe about 18 cents) from the wage paid, adds to it his own payment and purchases an insurance stamp from the Post-office for the total amount and affixes it to the card, cancelling the stamp for further such use by dating it. The Government increases this amount by a further contribution of its own and this builds the National Health Insurance Fund. From this the employee obtains free medical treatment when sick and if unable to attend his work a certain weekly payment as well. Additional benefits added of late years, are the supply of artificial teeth, spectacles and surgical appliances when prescribed by the physician. Suggestions have been made whereby the family of the insured person will also receive the same treatment at some future time by an adjustment of the Act.

"The medical attention and the supply of medicines work in this way. The insured person is required to register with a physician who receives a payment of about two dollars per annum per insured person registered with him, whether he attends to the insured individual every day of the year or even if no medical attention is given at all. The physician, when necessary, writes a prescription which the sick person takes to any pharmacist on the Government Panel, and in this way receives what is prescribed, payment being made to the pharmacist by the Government through one or other of its Insurance Committees. It may be noted that no patent medicines or proprietary articles may be prescribed by the physician for insured persons. Payment is made to the pharmacist after the prescriptions have been priced by a pricing committee which proceeds to do the pricing for each drug separately according to an agreed National Price List, then adding to the total the dispensing fee which varies according to whether it is a mixture, ointment, gargle, etc., which has been prescribed. It is the duty of the Retail Pharmacists' Union to arrange these prices with the Government.

"It may be of interest to you to know that at the end of the war the scale of contributions of certain workers was increased to build an insurance fund in order that the contributors could be insured against unemployment; they would receive a sum of money weekly for a certain number of weeks when unemployed through no fault of their own. This is the payment oftened referred to as the dole.

"I have tried to give you a bird's-eye view of pharmaceutical practice in Britain, but if there occurs to you any question on matters on which I have touched, or otherwise, I shall be glad to answer to the best of my ability."

At the conclusion of Mr. Lewis' remarks, President Gerstner thanked him for his fine address and assured him that the Branch had greatly enjoyed hearing him.

Professor Wimmer spoke of his visit to London a year ago and mentioned that he had been privileged to witness the conducting of the Qualifying Examinations for pharmacists; he referred to the pleasant time he spent with Professor Greenish, dean of the School of Pharmacy.

Dr. Lascoff, Mr. Seely and others asked questions of the speaker, to which Mr. Lewis replied.

Dr. Lascoff proposed that a rising vote of thanks be given Mr. Lewis and this was carried.

Dr. Fischelis thanked the Branch for electing him as its new president and he voiced the thanks of the Branch to the retiring president. Dr. Wimmer moved a vote of thanks to the outgoing president; this was carried and the meeting adjourned.

HERBERT C. KASSNER, *Secretary.*

NORTHERN OHIO.

The sixth regular meeting of the Northern Ohio Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held on December 12th in the lecture hall of the School of Pharmacy. The regular dinner of the Council preceded the meeting.

The meeting was called to order by Vice-President Spease. Minutes of the previous meeting were read and approved.

Vice-President Spease introduced the speaker of the evening, Prof. E. D. Davy, member

of the U. S. P. XI Revision Committee, who gave an interesting talk on some of the problems presented in the revision of the U. S. P. He explained the general chairman's reports issued to the members of the Revision Committee, which include the comments, suggestions and criticisms of individuals interested in the improvement of the Pharmacopœia, and he also gave a detailed report on the progress of the work of the sub-committee on inorganic chemicals and proximate assays, of which Professor Davy is a member.

Attention was called to the survey made on assay procedures such as vitamin assays and those drugs which at present are assayed chemically or have no assay and for which bioassays have been proposed, including such drugs as Spigelia, Pepo, Belladonna and Aspidium.

The speaker compared the Swedish, Dutch and German Pharmacopœias to that of our own and showed that the Dutch had many tests not included in the U. S. P. The criticisms offered in published articles to some of the assay methods were cited, and Professor Davy used for example four typical assays of U. S. P. drugs. He explained the reactions involved in the assay of Fowler's solution, Arsphenamine, Calcium Oxide and Sodium Nitrite, pointing out the basis of the criticism and explained the results of his work in the laboratory of the School of Pharmacy to develop new methods.

F. J. BACON, *Secretary.*

JOINT SESSION SCIENTIFIC AND PRACTICAL PHARMACY SECTION MINNESOTA STATE PHARMACEUTICAL ASSOCIATION AND NORTHWESTERN BRANCH OF THE A. PH. A.

The Joint Session of the Scientific and Practical Pharmacy Section of Minnesota Pharmaceutical Association and Northwestern Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION will be held in St. Paul in connection with the meeting of the Minnesota Association on February 19th.

Dean Frederick J. Wulling, *Chairman* of the Section, will preside with the assistance of Rugnar Almin, *President* of the Branch. President Lotus D. Coffman of the University of Minnesota and President H. C. Christensen of the A. PH. A. will be guests of honor.

The following is a partial program of the Joint Session:

The Chairman's Address, Frederick J. Wulling; "The International Standard for Digitalis," F. A. Upsher Smith; "Artistic Hobbies Practiced in the Art of Pharmacy," David F. Jones; "The Growing Importance of Professional Pharmacy," President H. C. Christensen, A. PH. A.; Address by L. D. Coffman; "Adventures in Botany," Gustave J. deMars.

Reports of committees will be made by the following chairmen:

Gustave J. deMars, Peter Vadheim, Rugnar Almin, Harry Iverson, Joseph Vadheim, E. B. Fisher, G. H. Countryman, C. H. Rogers, H. C. Kruckeberg, Miss Hallie Bruce, Charles T. Heller, G. T. Kermott, V. Noreen, W. B. Wardwell, C. V. Netz and Dr. Frederick J. Wulling.

Jerome A. Lacher will speak on "The Present Necessity of the Minimum Four-Year Course" and Dean Frederick J. Wulling will make a further reference to the "Need of a Pharmaceutical Federation." C. H. Rogers will speak on "Postgraduate Study in the College of Pharmacy of the University of Minnesota." The Dean will speak on "Pharmacy Faculty in Organizational Activities."

Anton Hogstad, Jr., will speak on "The Changing Order of American Pharmacy." D. D. Turner is down for a paper on "Disintegration of Aspirin Tablets." C. E. Smyithe on "Drug Store Types as Seen by an Outsider." Miss Laurine Jack and Prof. G. Bachman will present a paper on "The Proposed Method for Quantitative Analysis of Solution of Sulphurated Lime." Dr. E. L. Newcomb, C. V. Netz and E. B. Fisher are also down for papers.

The presentation of the scholarship token will be made by N. Vere Sanders.

PHILADELPHIA.

The January meeting of the Philadelphia Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION was held Tuesday evening, January 13th, at the Philadelphia College of Pharmacy and Science.

The meeting was preceded by the customary dinner, served at the Hotel Pennsylvania. Thirty members and guests attended. After the dinner, all returned to the College, where the auditorium had been converted into a court room.

The program for the evening was a Mock Trial, and a large number of students, guests and their friends had been invited. It was not the intention of the Local Branch to pro-

duce a burlesque, but instead to illustrate one of the hazards of professional service to the public. The cast was as follows:

Judge: Honorable Harry S. McDevitt, Common Pleas Court, Philadelphia County

Attorneys

For *Plaintiff:* Bryan Hermes, Esq., Assistant District Attorney, Philadelphia County

For *Defendant:* Matthew Kramer, Esq., Philadelphia County

Complainant's Side

Plaintiff: Isadore Shutt (Clifton C. Pines)

Witnesses for Plaintiff:

Michael Avella (Ralph L. Calvert), his friend

Dr. E. A. Mullen, his physician

Dr. Jos. W. E. Harrisson, chemist

John M. Woodside, member of the Pennsylvania Board of Pharmacy

Defendant's Side

Defendant: Ivor Griffith

Witnesses for Defendant:

Dr. Charles H. LaWall, chemist

George S. Gumphert (missing), clerk in store

Miss Evelyn Card, customer in store

Julius Brown, porter in store

Court Officers

Clerk: Harry Botthoff, Quarter Sessions Court, Philadelphia County

Stenographer: Miss Reba Kancher

Tipstaves: Edmund H. MacLaughlin, Leon Hunter, Paul C. Wieseman, John Kramer

Door Usher: Walter Wilcox, Janitor, P. C. P. and Sc.

The jury selected and sworn in consisted of John C. Eckel, Esq., W. W. Matos, Dr. Wm. D. Robinson, W. W. McNeary, O. W. Osterlund, Mrs. Marion Y. Walton, Mrs. Katherine C. Odenatt, Quintus Hoch, W. L. Cliffe, Edward Hahn, H. M. Watts, Dr. J. C. Doane, (all leaders in their respective professions).

The case was one of alleged negligence in which the proprietor's clerk sold to a customer some Salts of Lemon—proprietor and customer stating under oath that above-mentioned were to be used for different purposes. The proprietor contended that the customer had asked for salts to be used as a cleaning agent, while the customer stated he asked for salts of lemon to make lemonade. At any rate, Shutt and his friend concocted a drink, were made ill and Shutt was forced to lose much time and money. So he sued the proprietor of the drug store for loss sustained.

While very humorous at times, nevertheless many legal points were successfully portrayed.

The trial was a most successful one as evidenced by an attendance of approximately 600 persons, among whom were many pharmacists, physicians, chemists and members of the legal profession. Almost the entire Pennsylvania State Board of Pharmacy attended. S. L. Hilton, a prominent pharmacist, and Chairman of the Council, A. Ph. A. from Washington, D. C., answered his jury summons *via* aeroplane.

Dr. and Mrs. Fischelis attended, Dr. Fischelis *incognito* in so far as his newly elected office was concerned, since we were not aware of having entertained the newly elected president of the New York Branch, American Pharmaceutical Association, until after the adjournment of the trial at 11:15 P.M.

Any branch of the A. Ph. A. desiring information regarding a Mock Trial may obtain same by communicating with

William J. Stoneback, *Secretary pro tem.*

WESTERN NEW YORK.

"Druggists who attempt to prescribe for their customers and physicians who dispense medicines to their patients are dangerous to the community," declared John J. Nichols of New York city, director of the Iodine Educational bureau, speaking on "Professional Pharmacy Can and Will Succeed," at the monthly meeting of the Western New York branch, American Pharmaceutical Association in Foster Hall, University of Buffalo campus, January 15th.

"The American Medical Association supports this contention," Mr. Nichols pointed out. "A druggist is trained in the actions of drugs and not in the diagnosis of ailments, while the physician is trained in that diagnosis and not in the compounding of drugs. Modern chemical literature proves that pharmacists have played great rôles in research and have even made important discoveries, Mr. Nichols pointed out. Emphasis should be placed on the profession of pharmacy, to cater to the supply of physicians' needs and to fill prescriptions."

Prof. Lewis G. Freeman presided, and 50 members attended a dinner in the Alumni Club, 147 West North Street, sponsored by the senior and junior classes of the pharmacy

school which preceded the meeting in honor of Mr. Nichols. Dr. Frank J. Montrose, vice-president of the Mercer club, and Dr. Eli Long spoke.

LAWRENCE D. LOCKIE, *Secretary.*

PHARMACY REQUIREMENTS.

Secretary Robert P. Fischelis, of the N. J. Board of Pharmacy replied to an editorial of the *Newark News*, as follows, and in his reply discusses the recommendations and requirements of the N. A. B. P. and of the A. A. C. P. He refers to the editorial comment in the *News* of January 8th in which the question is raised, "whether the ruling promulgated by the Board of Pharmacy means that applicants for a certificate to practice pharmacy must have had a general four-year college course in addition to the regular course in pharmacy. Such a requirement is not contemplated." "At present the minimum technical course in pharmacy is one of three years. The new ruling increases the length of the entire course, to be required of prospective pharmacists, to four years.

"When the ruling under discussion goes into effect with the classes entering colleges of pharmacy in 1932, the pharmacy course will become a standard four-year course leading to the degree of Bachelor of Science in pharmacy. This is in line with the recommendations and requirements of the National Association of Boards of Pharmacy and the American Association of Colleges of Pharmacy. The latter association, through its committee on curriculum and teaching methods, has recommended to member colleges that the first two years of the course should consist of basal and cultural subjects in which fundamental training shall be presented as a foundation for the later science and technical courses. The third and fourth years are to be given over to pharmacy, pharmacognosy, pharmacology, bacteriology, specialized phases of chemistry and approved elective subjects.

"It is generally agreed that three years of college training in the technical subjects, in addition to the practical experience requirement, will turn out a qualified pharmacist, but a great need has been felt for the equivalent of a year of training in fundamental and cultural subjects which will enable the student to obtain a better grasp of his technical studies and his ultimate professional responsibilities. This is in line with sound educational procedure in other technical fields.

"If junior colleges are developed in the larger cities of this state, it is quite likely that credits for courses in the basal and cultural subjects completed in these institutions will be accepted in our colleges of pharmacy, although it would probably be to the advantage of the prospective pharmacy student to pursue his full course in the institution which is to give him his degree in pharmacy. The rules of the Board of Pharmacy of the State of New Jersey permit colleges of pharmacy to give credit for equivalent courses pursued in colleges of liberal arts and sciences, so that the student's time is not wasted if he decides to switch from a general course to a course in pharmacy."

U. S. P. AND N. F. PUBLICITY.

Chicago pharmacists are doing splendid work in popularizing for the U. S. P. and N. F. among physicians. In order to make this work more effective, maintain the interest of pharmacists and develop ideas—committees have been appointed in various sections of the city for carrying on the work of publicity. These sections hold monthly meetings and the program is arranged so that the members of one section can attend those of another. Splendid results have followed this campaign.

FIRST CALL OF THE SCIENTIFIC SECTION, A. PH. A.

The 79th annual convention of the AMERICAN PHARMACEUTICAL ASSOCIATION will be held in Miami, Florida, July 27 to August 1, 1931, at the Columbus Hotel. The officers of the Scientific Section are expecting a very interesting meeting and hope to secure your hearty coöperaton.

Will you please decide as soon as possible upon a title or titles for your contributions to the 1931 program and submit these together with a concise abstract to the secretary by May 1, 1931? The early submission of titles is necessary to insure proper inclusion in the printed program and only those papers announced in the program will be read unless time should permit a few additional late contributions. Abstracts will be multigraphed and made available at the meeting by the secretary if received by May 1st.

L. W. ROWE, *Secretary,*
% Parke, Davis & Co., Detroit.
E. E. SWANSON, *Chairman.*

REPORT ON EXTENT OF USE OF N. F. V GALENICALS.

BY E. N. GATHERCOAL, CHAIRMAN, NATIONAL FORMULARY COMMITTEE.

HISTORICAL.

In March 1930 a request was made of I. A. Becker, pharmacist at the Michael Reese Hospital of Chicago, to indicate the number of N. F. galenicals and the amount of each that he used annually in the hospital pharmacy.

Mr. Becker kindly went through Part I of National Formulary V, checking the items that he used and the approximate amount of each. He found some fifty such items that were used in large quantity; another group he classified as being used in medium quantity and a third group as being used in small quantity, sometimes not more than once a year.

It was suggested to him that he make further inquiry among hospital pharmacists in Chicago along the same line. He did so and then suggested that a list of all the preparations in Part I should be prepared as being more convenient than to use the N. F. and then copy the checked items by hand. Such a list was prepared with three columns headed: "In Large Quantity," "In Medium Quantity," "In Small Quantity."

Mr. Becker then obtained the addresses of hospitals outside of Chicago as furnished by Dr. Caldwell, Secretary of the American Hospital Association, so that a total of 95 finally were reached. A personal letter was addressed to each hospital superintendent requesting the pharmacist to check and return the list. Up to December 1st, when the survey was closed, 76 of these had responded.

In the meantime, Chairman Gathercoal had addressed letters to pharmaceutical friends in most of the states or larger cities, asking for a list of the prominent prescription pharmacies in these states and cities. Nearly all of these friends responded with lists varying from three to forty names and the total number of pharmacists doing either an exclusively prescription business or having large prescription departments in their stores in this list is 330. The mimeographed National Formulary galenical list with a letter of explanation was sent to each of these pharmacies. Up to December 1st, 213 of these lists have been returned and in nearly every case, the checking of the list by the pharmacist was apparently carefully done.

At the request of Dr. E. L. Newcomb of New York City, Editor Herbert Mayes kindly volunteered to have the N. F. galenical list printed and mailed to each subscriber to the *American Druggist*. This was done and returns rapidly came in. Up to December 1st, these totalled 625.

THE EXTENT OF THE SURVEY.

The entire survey on the extent of use of N. F. V galenicals may be summarized as follows:

	Number reporting.		Number reporting.
ALABAMA (pop. 2,644,477)		COLORADO (pop. 1,033,156)	
Hospital pharmacies	1 (210 beds)	Hospital pharmacies	7 (1636 beds)
Prescription pharmacies	2 (27,098 ℞)	Prescription pharmacies	8 (73,619 ℞)
General drug stores	5	General drug stores	3
ARIZONA (pop. 435,573)		CONNECTICUT (pop. 1,606,903)	
Hospital pharmacies	0	Hospital pharmacies	1 (737 beds)
Prescription pharmacies	0	Prescription pharmacies	0
General drug stores	6	General drug stores	15
ARKANSAS (pop. 1,854,482)		DELAWARE (pop. 238,380)	
Hospital pharmacies	1 (125 beds)	Hospital pharmacies	0
Prescription pharmacies	0	Prescription pharmacies	0
General drug stores	10	General drug stores	2
CALIFORNIA (pop. 5,642,282)		DISTRICT OF COLUMBIA (pop. 486,869)	
Hospital pharmacies	3 (2117 beds)	Hospital pharmacies	1 (500 beds)
Prescription pharmacies	14 (570,664 ℞)	Prescription pharmacies	4 (40,422 ℞)
General drug stores	19	General drug stores	3

	Number reporting.
FLORIDA (pop. 1,465,969)	
Hospital pharmacies	2 (375 beds)
Prescription pharmacies	5 (53,380 ℞)
General drug stores	25
GEORGIA (pop. 2,901,127)	
Hospital pharmacies	1 (200 beds)
Prescription pharmacies	2 (38,041 ℞)
General drug stores	10
IDAHO (pop. 445,032)	
Hospital pharmacies	0
Prescription pharmacies	0
General drug stores	1
ILLINOIS (pop. 7,630,283)	
Hospital pharmacies	6 (5344 beds)
Prescription pharmacies	10 (391,671 ℞)
General drug stores	33
INDIANA (pop. 3,225,418)	
Hospital pharmacies	3 (1246 beds)
Prescription pharmacies	14 (159,961 ℞)
General drug stores	14
IOWA (pop. 2,467,900)	
Hospital pharmacies	2 (1289 beds)
Prescription pharmacies	1 (13,097 ℞)
General drug stores	5
KANSAS (pop. 1,882,518)	
Hospital pharmacies	0
Prescription pharmacies	11 (196,663 ℞)
General drug stores	20
KENTUCKY (pop. 2,622,809)	
Hospital pharmacies	0
Prescription pharmacies	2 (54,784 ℞)
General drug stores	16
LOUISIANA (pop. 2,098,876)	
Hospital pharmacies	3 (2265 beds)
Prescription pharmacies	7 (354,361 ℞)
General drug stores	12
MAINE (pop. 797,423)	
Hospital pharmacies	1 (190 beds)
Prescription pharmacies	0
General drug stores	8
MARYLAND (pop. 1,625,279)	
Hospital pharmacies	2 (997 beds)
Prescription pharmacies	10 (165,936 ℞)
General drug stores	6

	Number reporting.
MASSACHUSETTS (pop. 4,249,614)	
Hospital pharmacies	2 (721 beds)
Prescription pharmacies	8 (156,071 ℞)
General drug stores	18
MICHIGAN (pop. 4,818,371)	
Hospital pharmacies	4 (2562 beds)
Prescription pharmacies	6 (186,076 ℞)
General drug stores	17
MINNESOTA (pop. 2,558,265)	
Hospital pharmacies	1 (661 beds)
Prescription pharmacies	7 (256,769 ℞)
General drug stores	17
MISSISSIPPI (pop. 2,009,821)	
Hospital pharmacies	0
Prescription pharmacies	0
General drug stores	10
MISSOURI (pop. 3,629,367)	
Hospital pharmacies	2 (1067 beds)
Prescription pharmacies	5 (375,509 ℞)
General drug stores	13
MONTANA (pop. 533,519)	
Hospital pharmacies	0
Prescription pharmacies	2 (13,050 ℞)
General drug stores	4
NEBRASKA (pop. 1,386,619)	
Hospital pharmacies	0
Prescription pharmacies	6 (122,731 ℞)
General drug stores	9
NEVADA (pop. 91,058)	
Hospital pharmacies	0
Prescription pharmacies	0
General drug stores	1
NEW HAMPSHIRE (pop. 465,293)	
Hospital pharmacies	0
Prescription pharmacies	0
General drug stores	6
NEW JERSEY (pop. 4,041,334)	
Hospital pharmacies	3 (950 beds)
Prescription pharmacies	0
General drug stores	27
NEW MEXICO (pop. 423,317)	
Hospital pharmacies	0
Prescription pharmacies	0
General drug stores	1

	Number reporting.
New York (pop. 12,609,555)	
Hospital pharmacies	5 (3824 beds)
Prescription pharmacies	14 (381,908 ℞)
General drug stores	101
North Carolina (pop. 3,165,146)	
Hospital pharmacies	0
Prescription pharmacies	10 (86,383 ℞)
General drug stores	20
North Dakota (pop. 681,273)	
Hospital pharmacies	0
Prescription pharmacies	3 (22,432 ℞)
General drug stores	4
Ohio (pop. 6,629,373)	
Hospital pharmacies	3 (1360 beds)
Prescription pharmacies	20 (253,168 ℞)
General drug stores	37
Oklahoma (pop. 2,396,040)	
Hospital pharmacies	1 (225 beds)
Prescription pharmacies	0
General drug stores	11
Oregon (pop. 951,790)	
Hospital pharmacies	1 (350 beds)
Prescription pharmacies	5 (97,475 ℞)
General drug stores	6
Pennsylvania (pop. 9,638, 099)	
Hospital pharmacies	5 (1662 beds)
Prescription pharmacies	13 (227,512 ℞)
General drug stores	47
Rhode Island (pop. 687,497)	
Hospital pharmacies	1 (253 beds)
Prescription pharmacies	0
General drug stores	6
South Carolina (pop. 1,738,765)	
Hospital pharmacies	1 (325 beds)
Prescription pharmacies	0
General drug stores	9
South Dakota (pop. 691,008)	
Hospital pharmacies	1 (125 beds)
Prescription pharmacies	3 (33,616 ℞)
General drug stores	3
Tennessee (pop. 2,616,556)	
Hospital pharmacies	1 (500 beds)
Prescription pharmacies	0
General drug stores	8
Texas (pop. 5,810,683)	
Hospital pharmacies	2 (825 beds)
Prescription pharmacies	7 (146,489 ℞)
General drug stores	14
Utah (pop. 502,640)	
Hospital pharmacies	1 (185 beds)
Prescription pharmacies	1 (3272 ℞)
General drug stores	2
Vermont (pop. 359,611)	
Hospital pharmacies	0
Prescription pharmacies	0
General drug stores	4
Virginia (pop. 2,418,075)	
Hospital pharmacies	1 (80 beds)
Prescription pharmacies	6 (156,435 ℞)
General drug stores	0
Washington (pop. 1,563,396)	
Hospital pharmacies	2 (350 beds)
Prescription pharmacies	5 (284,190 ℞)
General drug stores	0
Wisconsin (pop. 3,000,388)	
Hospital pharmacies	3 (916 beds)
Prescription pharmacies	1 (9800 ℞)
General drug stores	14
Wyoming (pop. 224,693)	
Hospital pharmacies	0
Prescription pharmacies	1 (3035 ℞)
General drug stores	0

It is a matter of interest to note that the reports listed above have been received from 47 States and the District of Columbia; reports from hospital pharmacies from 32 States and the District of Columbia; reports from prescription pharmacies from 32 States and the District of Columbia; and reports from general drug stores from 45 States and the District of Columbia.

The Hospital Pharmacies.—The hospital pharmacies represent 34,172 beds. Information from the Secretary of the American Hospital Association indicates that in 1929 there were 1558 hospitals with 261,803 beds in the Association. Therefore, our report represents about 13% of the beds in the Association. However, the total number of beds in hospitals of all kinds in the United States was estimated in 1928 to be 824,342. About half of the hospitals reporting have no out-patient clinic and, therefore, compound relatively few, if any, prescriptions. Hospitals with out-patient clinics frequently fill a very large number of prescriptions. The extent of use

of N. F. items in the hospitals is not as great, on the average, as in the prescription pharmacies. This is to be expected, for the range of medicinal agents used by any one physician is very limited, and the range of medicinal agents used in a hospital is limited to the combined ranges of its attending staff. Frequently also, a few leading members of the staff markedly influence the younger members of the staff in their selection of medicinal agents. Our records show that those hospitals with large out-patient clinics where perhaps scores of physicians and surgeons are on the attending staff have as wide a range of use of N. F. items as do the larger prescription stores.

The data obtained from the hospital pharmacies as to the extent of use of N. F. galenicals certainly should represent the viewpoint of physicians on the use of these preparations; for the hospitals use very little medicine except under the direction of physicians.

The Prescription Pharmacies.—The 213 prescription stores report an annual prescription fill of 4,976,618, which is an average prescription fill of 23,365 annually. As a matter of fact, however, a number of these reports cover chains of stores so that the actual stores represented is somewhat greater than 213. A few of these prescription stores are also in the nature of supply houses both for physicians, for other smaller drug stores, and especially for small hospitals, clinics and first-aid rooms in factories, department stores, etc. Hence their stocks of medicines are large and broad in range.

The data on the use of N. F. galenicals obtained from stores that have a relatively large annual prescription fill or that are exclusive prescription stores again gives a fair idea of how the physician uses N. F. preparations. It is true that quite a number of the N. F. preparations are sold over the counter in the form of household remedies. Some N. F. preparations, such as ampuls, are used almost exclusively by physicians, but are not extensively represented in prescriptions.

The General Drug Stores.—We have no data on the number of prescriptions filled in the general drug stores reporting in the *American Druggist Survey.*

THE TABULATION OF THE DATA.

The three surveys, *viz.*, those of the hospital pharmacies, the prescription pharmacies and the general drug stores are combined into one tabulation. The extent of use of each galenical

Preparations Used Extensively.	Hospital Pharmacies, Per Cent.	Prescription Pharmacies, Per Cent.	Drug Stores. Per Cent.
Acid Nitrohydrochlor. Dil.	56	89	63
Amp. Caff. Sod.-Benz.	94	76	45
Amp. Sod. Cacodyl.	94	86	56
Aq. Hamam.	79	93	68
Collod. Salicyl. Co.	47	53	78
Elix. Ammon. Valer.	66	88	55
Elix. Brom. Tri.	82	91	78
Elix. Ferr. Quin. et Strych.	82	91	81
Elix. Terpin Hyd. et Codein.	90	93	78
Ext. Opii	59	73	37
Fldext. Gentian.	49	81	49
Fldext. Sarsap. Co.	62	87	59
Liq. Alumin. Acet.	77	79	49
Liq. Antisept.	81	93	64
Lotio Calam.	82	85	86
Magma Bism.	65	72	41
Pil. A. S. et B.	75	81	50
Sp. Æth. Co.	82	87	56
Syr. Hypophos. Co.	59	86	54
Syr. Pin. Alb. Co.	70	90	69
Tr. Arnic.	60	94	81
Tr. Delphin.	68	76	50
Tr. Gelsem.	57	84	45
Ung. Hydrarg. Chlor. Mit.	68	71	42
Ung. Resorcin. Co.	59	78	54

as "Large," "Medium" or "Small" is shown in the hospital pharmacies and the prescription pharmacies. The total number of stores and pharmacies using each galenical is shown under each survey and also the percentage of such stores or pharmacies as compared with the total number reporting is shown under each survey.

We find in this tabulation that the N. F. preparations are used on the average in about one-fourth of the general drug stores and in about one-half of the prescription stores. No N. F. galenical was used in all of the pharmacies in any of the three surveys. The largest use was that of Tincture of Arnica which reached 94% among the prescription stores.

The preparations named in the foregoing table are among those very extensively used.

As to the accuracy of the individual reports submitted by the pharmacists there is no means of positive determination. However, there is no reason why the pharmacist should not submit a report accurate to the best of his knowledge and judgment. A careful re-check was made in several instances and no marked discrepancies in the two reports even from different men in the same store were found. Some variation in the amount used whether "Large," "Medium" or "Small," was noted, but very little variation was found in the items "Used" or "Not Used." One hospital sent in two reports about 3 months apart. This was due to our inadvertently sending the galenical list twice to the same hospital, though the second mailing was not intentional. The first report returned was entered in the tabulation and the second one not entered. There were 54 changes in the second report out of a possible 565. This is less than 10% variation. If the second report had been entered instead of the first one, 30 items would have been advanced and 24 items lowered in standing; 13 would have been added as being used and 10 would have been dropped as not used. While these figures may appear large, they are not really so, for the report covers 15 closely typewritten pages, 565 items.

The data as presented in the tabulation herewith is of great value to the National Formulary Committee as it gives a fairly clear picture of the extent to which the preparations of the N. F. V are being used in the United States.

Abbreviated Name of Preparation.	Hospital Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Prescription Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Drug Stores. Total using.	Per cent using.
Acet. Arom.			8	8	10		5	24	29	13	48	8
Acid. Nitrohydrochl.	1	4	20	25	33	7	31	96	134	63	250	40
Acid. Nitrohydrochl. Dil.	4	7	32	43	56	22	47	121	190	89	402	63
Ampul. Caff. Sod.-Benz.	56	13	2	71	94	39	62	61	162	76	285	45
Ampul. Camph.	20	24	24	68	90	24	45	109	178	84	252	40
Ampul. Emet. Hydrochl.	7	9	38	54	71	11	30	89	130	61	114	18
Ampul. Iodi	2		8	10	13	4	12	36	52	24	30	5
Ampul. Quin. et Urea Hydrochl.	4	7	43	54	71	18	50	85	153	72	208	33
Ampul. Quin. Dihydrochl.	5	5	36	46	60	11	30	64	105	50	64	10
Ampul. Sod. Cacodyl.	23	17	31	71	94	77	63	44	184	86	355	56
Aq. Hamam.	11	15	34	60	79	119	52	26	197	93	431	68
Aq. Phenol.	2	3	14	19	25	10	9	51	70	33	130	21
Caff. Sod.-Sal.	11	8	16	35	46	12	31	46	89	42	160	26
Catapl. Kaolin.	2	4	22	28	37	6	18	51	75	35	101	16
Ceratum Camph.		2	9	11	14	4	11	44	59	28	50	8
Cerat. Plumb. Subacet.		1	14	15	20	1	23	92	116	55	143	23
Cerat. Resin. Co.		3	20	23	30	18	37	92	147	69	262	42
Charta Pot. Nit.		1	8	9	12	1		16	17	8	17	3
Chloral Camph.		4	18	22	29	6	21	73	100	47	97	16
Collod. Bitum. Sulphon.	1	3	5	9	12	1	6	12	19	9	9	1
Collod. Salicyl. Co.	3	11	22	36	47	13	27	71	112	53	111	18
Collod. Stypt.	2	4	15	21	27	4	11	49	64	30	90	14
Confect. Ros.			8	8	10	5	7	42	54	25	27	4
Confect. Senn.			10	10	13	3	8	56	67	31	47	7
Curat. Paraf.	1	2	8	11	14		4	13	17	8	7	1
Dentif.	2		4	6	8	1	5	11	17	8	9	1
Dentilin. Aconit. Co.		1	9	10	13	2	6	33	41	19	62	10
Dentilin. Aconit. et Iod. Co.	1	1	17	19	25	5	13	82	100	47	108	17
Elix. Aletrid. Co.		1	6	7	9	3	16	68	87	41	115	18
Elix. Ammon. Brom.	3	8	16	27	36	7	34	82	123	58	206	33

Abbreviated Name of Preparation.	Hospital Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Prescription Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Drug Stores. Total using.	Per cent using.
Elix. Ammon. Valer.	4	12	35	51	66	22	75	91	188	88	353	55
Elix. Amygdal. Co.	6	3	6	15	20	9	20	44	73	34	89	14
Elixir Anis.			8	8	10	2	10	49	61	29	94	15
Elix. Arom. Rub.	4	4	12	20	26	16	28	48	92	43	147	24
Elix. Aurant. Amar.	2	5	7	14	19	2	11	44	57	27	47	8
Elix. Bism.	2	1	5	8	10	6	15	55	76	36	52	8
Elix. Bromid. Quinq.	11	8	20	39	51	62	63	54	179	84	421	66
Elix. Brom. Tri.	21	19	23	63	82	76	70	47	193	91	497	80
Elix. Buchu	2	3	12	17	22	15	28	77	120	56	313	50
Elix. Buchu Co.	2	3	14	19	25	12	29	52	93	44	157	25
Elix. Buchu et Pot. Acet.	4	6	17	27	36	18	35	69	91	43	242	39
Elix. Buchu, Junip. et Pot. Acet.	5	7	17	29	38	62	60	60	182	86	368	58
Elix. Calc. et Sod. Glycerophos.		8	36	44	57	36	61	76	173	81	286	46
Elix. Calc. Lactophos.		3	20	23	30	7	25	87	119	56	184	30
Elix. Card. Co.	1	5	17	23	30	9	11	54	74	35	92	15
Elix. Carn. et Ferr.		6	12	18	23	14	26	42	82	39	123	20
Elix. Casc. Sagr.	7	2	9	18	23	4	15	50	69	32	77	12
Elix. Casc. Sagr. Co.	2	2	8	12	16	7	10	35	52	24	51	8
Elix. Catar. et Foenic.		1	17	18	23	21	53	111	185	87	462	74
Elix. Cathart. Co.			4	4	5	3	8	24	35	16	47	8
Elix. Chlorid.			1	1	1		12	20	32	15	29	4
Elix. Cinchon. Alk.	3	1	13	17	22	22	31	58	111	52	235	37
Elix. Cinchon. et Ferr.	1	2	5	8	10	2	19	41	62	29	55	9
Elix. Cinchon. Ferr. et Bism.	2		7	9	12		9	30	39	18	25	4
Elix. Cinchon. Ferr. Bism. et Strych.	2		4	6	8	4	13	36	53	25	42	7
Elix. Cinchon. Ferr. et Strych.	4	2	2	8	10	5	14	35	54	25	93	15
Elix. Coryd. Co.				0			4	34	38	18	21	3
Elix. Eriodict. Arom.			9	9	12	3	14	53	70	33	50	8
Elix. Euphorb. Co.		1	10	11	14	5	5	28	38	18	42	7
Elix. Ferr. Pyrophos. Quin. et Strych.	11	4	10	25	33	46	27	48	121	57	175	28
Elix. Ferr. Quin. et Strych.	46	12	5	63	82	124	45	25	194	91	512	82
Elix. Gent.	1	9	20	30	40	23	52	79	154	73	196	31
Elix. Gent. et Ferr.	1	2	19	22	29	16	27	76	119	56	141	23
Elix. Gent. et Ferr. Phos.			8	8	10	2	17	40	59	28	37	6
Elix. Gentian. Glycerin.	3	12	20	35	46	57	57	58	172	81	321	52
Elix. Glycerophos. Co.	7	11	33	51	66	72	67	43	182	85	327	53
Elix. Glycyrrh. Aq.	2	1	10	13	17	7	10	45	62	29	36	6
Elix. Guar.			9	9	12	3	9	46	58	27	55	9
Elix. Guaran. et Apii		1	8	9	12	4	11	50	65	31	54	9
Elix. Heloniad. Co.		3	13	16	21	10	19	67	96	45	121	20
Elix. Hydrang. et Lith.		1	6	7	9	3	14	63	80	38	85	14
Elix. Hydrast. Co.	2	4	6	12	16	3	10	44	57	27	59	9
Elix. Manac. Co.	1		3	4	5	1	6	17	24	11	8	1
Elix. Pepsin	5	5	19	29	38	16	37	65	118	55	206	33
Elix. Pepsin. Bism. et Strych.	3	5	10	18	23	18	30	100	148	70	179	29
Elix. Pepsin. Co.	7	4	5	16	21	29	22	41	92	43	63	10
Elix. Pepsin. et Bism.	4	3	4	11	14	13	18	86	117	55	165	27
Elix. Pepsin. et Rennin. Co.	8	5	3	16	21	25	19	24	68	32	63	10
Elix. Phosphor.	2	2	3	7	9		8	66	74	35	132	21
Elix. Phosphor. et Nuc. Vom.	2	3	2	7	9		10	52	62	29	46	8
Elix. Pot. Brom.	5	12	27	44	57	44	53	63	160	75	200	32
Elix. Sabal et Santal. Co.	3	4	6	63	82	24	27	58	109	51	93	15
Elix. Sod. Brom.	17	12	25	54	71	51	45	66	162	76	279	44
Elix. Sod. Salicyl.	6	7	11	24	31	16	28	60	104	49	137	22
Elix. Sod. Salicyl. Co.		5	4	9	12	9	19	55	83	39	84	14
Elix. Tarax. Co.			13	13	17	16	33	75	124	58	99	16
Elix. Terpin. Hyd.	23	17	15	55	72	74	51	40	165	78	444	70
Elix. Terpin. Hyd. et Codein.	41	19	8	68	90	102	61	35	198	93	497	78
Elix. Terpin. Hyd. et Creosot. Co.	4	4	7	15	20	12	20	53	85	40	122	20
Elix. Tong. et Salicyl.		1	5	6	8	15	21	51	87	41	110	18

Abbreviated Name of Preparation.	Hospital Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Prescription Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Drug Stores. Total using.	Per cent using.
Elix. Vanillin. Co.		4	7	11	14	9	15	44	68	32	49	8
Elix. Viburn. Opul. Co.	6	2	19	27	36	15	34	83	132	62	143	23
Elix. Viburn. Prun.	5	8	19	32	42	15	32	85	132	62	241	39
Emp. Fusc. Camph.			3	3	4	8	4	24	36	17	57	9
Emp. Sapon.		2	3	5	6	3	5	35	43	20	15	2
Emuls. Ol. Morrh. c. Hypophos.	2	5	8	15	20	31	34	63	128	60	231	37
Emuls. Ol. Morrh. c. Malt.	9	6	19	34	45	16	28	41	85	40	127	20
Emuls. Ol. Morrh. c. Vitel.	2	1	3	6	8	10	18	55	83	39	45	7
Emuls. Ol. Ricin.	2	1	6	9	12	5	9	51	65	31	75	12
Emuls. Petrolat.	4	6	12	22	29	15	17	65	97	46	90	15
Ext. Conii			6	6	8		1	34	35	16	19	3
Ext. Ergot. Aq.	4	6	15	25	33	12	25	55	92	43	55	9
Ext. Euonymi			3	3	4		1	45	46	22	21	3
Ext. Ferr. Pomat.		1	2	3	4	3	9	27	39	18	34	5
Ext. Gentian.	2	8	25	35	46	29	45	83	157	74	234	38
Ext. Haematox.			6	6	8		4	27	31	14	17	3
Ext. Hydrast.		3	20	23	30	7	37	73	117	55	161	26
Ext. Ignat.			7	7	9	1	5	22	28	13	14	2
Ext. Kramer.			5	5	6	1	6	39	46	22	26	4
Ext. Leptand.			7	7	9	2	9	54	65	31	33	5
Ext. Opii	3	11	31	45	59	22	37	96	155	73	230	37
Ext. Sumbul			13	13	17	9	33	74	116	55	90	15
Ext. Tarax.		1	17	18	23	10	28	91	129	61	143	23
Ferr. Oxid. Sacch.	1	2	12	15	20	11	20	70	101	48	72	12
Fldext. Aconit.	4	11	27	42	55	14	44	121	179	84	361	57
Fldext. Adonid.			8	8	10	2	5	41	48	22	84	13
Fldext. Aletrid.			7	7	9	2	11	85	98	46	73	12
Fldext. Angel. Rad.			3	3	4	1	3	40	44	21	22	4
Fldext. Apii Fruct.		1	5	6	8		9	52	61	29	45	7
Fldext. Apocyn.		2	17	19	25	3	9	76	88	41	71	11
Fldext. Aral.			2	2	3	1	6	19	26	12	13	2
Fldext. Arnic.	1	6	22	29	38	18	39	92	149	70	166	27
Fldext. Asclep.			5	5	6	1	5	59	65	31	43	7
Fldext. Aven. Sativ.			1	1	1		5	34	39	18	35	6
Fldext. Baptis.	1		8	9	12	3	2	59	64	30	38	6
Fldext. Berber.		2	4	6	8		11	73	84	40	58	9
Fldext. Boldi			1	1	1	1	5	25	31	14	16	3
Fldext. Buchu Co.		3	17	20	26	9	27	84	120	56	81	13
Fldext. Calend.			11	11	14	5	15	86	106	50	133	21
Fldext. Calumb.		3	13	16	21	7	13	107	127	60	128	21
Fldext. Castan.			4	4	5	2	15	73	90	42	98	16
Fldext. Catar.		1	3	4	5	3	7	65	75	35	82	13
Fldext. Cauloph.			2	2	3	1	11	77	89	42	79	13
Fldext. Chimaph.			1	1	1		3	49	52	24	27	4
Fldext. Chionanth.		1	2	3	4	3	15	70	88	41	98	16
Fldext. Chirat.			1	1	1		5	38	43	20	19	3
Fldext. Cocillan.	2		5	7	9	1	8	36	45	21	50	8
Fldext. Coff.			4	4	5		2	22	24	11	17	3
Fldext. Colch. Corm.		2	21	23	30	5	19	97	121	57	124	20
Fldext. Condur.			15	15	20	11	23	96	130	61	146	24
Fldext. Conval. Rad.			7	7	9	1	9	97	107	50	78	13
Fldext. Copt.				0			2	21	23	11	11	2
Fldext. Corni			1	1	1	1	1	30	32	15	25	4
Fldext. Corydal.			3	3	4		5	63	68	32	30	5
Fldext. Cubeb.			5	5	6	3	12	97	112	53	129	21
Fldext. Cypriped.			2	2	3	1	15	75	91	43	55	9
Fldext. Damian.		2	4	6	8	7	16	95	118	55	118	19
Fldext. Digit.	7	4	19	30	40	27	40	102	169	79	314	50
Fldext. Dioscor.			4	4	5	2	16	74	92	43	94	15
Fldext. Droser.				0			3	40	43	20	26	4

Abbreviated Name of Preparation.	Hospital Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Prescription Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Drug Stores. Total using.	Per cent using.
Fldext. Dulcam.		1	3	4	5	1	4	43	48	23	35	6
Fldext. Echin.		2	16	18	23	9	24	109	142	67	185	30
Fldext. Euonym.			6	6	8	2	12	92	106	50	83	13
Fldext. Eupator.		1	4	5	6	3	5	85	93	44	59	9
Fldext. Euphorb.		1	9	10	13	4	16	82	102	48	111	18
Fldext. Frang.		1	7	8	10	8	32	84	124	58	197	31
Fldext. Fuci				0		1	3	19	23	11	25	4
Fldext. Galeg.			1	1	1	1	9	44	54	25	21	3
Fldext. Gelsem.		3	25	28	37	10	37	111	158	75	239	38
Fldext. Gentian.	2	11	23	36	47	35	42	96	173	81	309	49
Fldext. Geran.		1	3	4	5	1	10	51	62	29	48	8
Fldext. Gossyp. Cort.	1	5	15	21	27	32	59	99	190	89	437	69
Fldext. Grindel.	3	7	25	35	46	29	53	87	169	80	287	46
Fldext. Guarana		2	4	6	8	7	22	79	108	51	72	12
Fldext. Hamamel. Fol.	1	1	14	16	21	11	36	106	153	72	237	38
Fldext. Helon.	1	2	6	9	12	4	15	88	107	50	67	11
Fldext. Humul.		2	5	7	9	1	13	75	89	42	77	12
Fldext. Hydrang.		2	1	3	4	4	14	84	102	48	89	14
Fldext. Irid. Vers.		1	2	3	4	3	6	73	82	39	77	12
Fldext. Jalap.		1	8	9	12	2	14	71	87	41	81	13
Fldext. Jugland.			2	2	3	1	3	46	50	23	24	4
Fldext. Junip.		1	3	4	5	5	9	60	74	35	94	15
Fldext. Kav.		1	3	4	5	2	10	76	88	41	64	10
Fldext. Kol.		1	6	7	9	2	12	58	72	34	50	8
Fldext. Kramer.		4	11	15	20	6	17	97	120	56	132	21
Fldext. Lapp.		1	4	5	6	5	9	77	91	43	110	18
Fldext. Leptand.		1	3	4	5	3	9	96	108	51	116	19
Fldext. Lobel.	4	6	20	30	40	8	31	112	151	71	277	44
Fldext. Lupulin.		1	5	6	8	1	10	68	79	37	67	11
Fldext. Manac.			1	1	1	1	3	30	34	16	22	4
Fldext. Matic.			1	1	1	1	4	35	40	19	23	4
Fldext. Mezer.			1	1	1	1	5	32	38	18	13	2
Fldext. Mitchel.			2	2	3	1	4	33	38	18	21	3
Fldext. Nuc. Vom.	10	6	20	36	47	30	44	98	172	81	388	61
Fldext. Pareir.			2	2	3	5	5	48	58	27	29	5
Fldext. Phytolac.		2	8	10	13	6	37	105	148	70	183	29
Fldext. Prun. Virg.	5	10	12	27	36	29	47	90	166	78	319	51
Fldext. Quass.	3	5	15	23	30	7	22	87	116	55	159	25
Fldext. Querc.		1	3	4	5	2	12	55	69	32	39	6
Fldext. Rham. Cathart.		1	8	9	12	14	22	58	94	44	107	17
Fldext. Rubi		1	5	6	8		5	57	62	29	43	7
Fldext. Rumic.		2	2	4	5	3	14	64	81	38	76	12
Fldext. Sabal		1	6	7	9	4	11	72	87	41	58	9
Fldext. Sanguin.		1	12	13	17	4	17	107	128	60	70	11
Fldext. Santal Alb.	1	2	3	6	8	1	11	62	74	35	65	11
Fldext. Sarsap. Co.	11	11	26	48	62	59	76	50	185	87	376	60
Fldext. Scopar.			3	3	4	1	6	55	62	29	36	6
Fldext. Scutellar.			1	1	1	3	4	65	72	34	45	7
Fldext. Senecion.			3	3	4	3	5	46	54	25	30	5
Fldext. Serpentar.			9	9	12		12	103	115	54	104	17
Fldext. Solan.			1	1	1	1	6	36	43	20	21	3
Fldext. Stilling.			10	10	13	5	25	104	134	63	185	30
Fldext. Stilling. Co.			5	5	6	5	20	68	93	44	115	18
Fldext. Stramon.	2	8	15	25	33	1	30	99	130	61	157	25
Fldext. Tara.	2	2	14	18	23	22	43	107	172	81	273	43
Fldext. Thuj.			4	4	5		5	64	69	32	55	9
Fldext. Thym.			3	3	4	2	6	53	61	29	59	9
Fldext. Tong.			2	2	3	3	6	39	48	22	28	4
Fldext. Trifol.		1	11	12	16	7	31	73	101	48	156	25
Fldext. Trifol. Co.		2	10	12	16	15	39	63	117	55	140	23

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Fldext. Trill.			1	1	1	2	5	43	50	23	37	6
Fldext. Tritic.	1	1	11	13	17	19	38	95	151	71	184	29
Fldext. Valer.	1	7	28	36	47	23	39	89	151	71	197	31
Fldext. Verbasc. Fol.				0		2	4	35	41	19	43	7
Fldext. Viburn. Opul.	2	3	23	28	37	15	44	108	167	79	243	39
Fldext. Viburn. Prun.	2	8	23	33	44	23	57	101	181	85	287	46
Fldext. Xanthox.		2	8	10	13	3	20	96	119	56	93	15
Fldext. Zea		2	9	11	14	12	32	89	133	63	143	23
Fldglycer. Casc. Sagr.	3	2	1	6	8	10	10	15	35	60	56	9
Fldglycer. Casc. Sagr. Arom.	7		2	9	12	17	8	13	38	18	56	9
Fldglycer. Glycyrrhiz.		3	3	6	8	6	18	29	53	25	61	10
Fldglycer. Kramer.			5	5	6	2	1	19	22	10	19	3
Fldglycer. Rhei		1	3	4	5	1	4	12	17	8	37	6
Formal. Cresol.				0			5	19	24	11	3	1
Garg. Guaiac. Co.			3	3	4	4	3	21	28	13	25	4
Glycer. Bism.		2	6	8	10		8	48	56	26	94	15
Glycer. Pepsin.		3	8	11	14	6	21	74	101	48	103	17
Glycer. Pic. Pin.		2		2	3		6	21	27	12	18	3
Glycer. Trag.		2	5	7	9		7	47	54	25	25	4
Glycer. Vitell.				0		2	6	18	26	12	11	2
Glycerogel. Acid. Salicyl.			2	2	3	2	4	8	14	7	6	1
Glycerogel. Iodof.			4	4	5		3	3	6	3	4	1
Glycerogel. Zinc. Dur.	5	1	5	11	14	3	5	23	31	14	9	1
Glycerogel. Zinc. Mol.		1	3	4	5	4	7	19	30	14	7	1
Gossyp. Stypt.		4	1	5	6	1	4	21	26	12	42	7
Inf. Brayer.				0			1	6	7	4	7	1
Inf. Gentian. Co.	1	4	8	13	17	10	18	64	92	43	108	17
Inf. Ros. Co.	1	1		2	3	1	6	14	21	10	9	1
Inf. Senn. Co.	1	5	15	21	27	6	16	65	87	41	85	13
Inunct. Menthol.	2		7	9	12	6	3	23	32	15	24	4
Inunct. Menthol. Co.	3	3	7	13	17	6	7	20	33	15	30	5
Lac. Ferment.		5	1	6	8	2	4	8	14	7	15	3
Lavat. Ori	2	3	3	8	10	2	2	11	15	7	11	2
Lin. Aconit. et Chlorof.		2	15	17	22	7	15	94	116	55	143	23
Lin. Ammon.	2		17	19	25	12	30	117	159	75	250	40
Lin. Bellad.	2		23	25	33	8	32	100	140	66	234	38
Lin. Calam.	5	15	11	31	41	20	30	51	101	48	179	29
Lin. Opii Co.		1	14	15	20	7	10	48	65	31	65	10
Lin. Sapon. Camph	13	20	16	49	64	46	58	54	158	75	367	58
Lin. Sapon. Mol. Co.	8	3	12	23	30	26	42	52	120	56	176	28
Lin. Sinap. Co.		2	5	7	9	1	6	46	53	25	16	3
Lin. Terebinth.	2	4	9	15	20	5	23	79	97	46	155	25
Lin. Terebinth. Acet.			7	7	9	16	14	56	86	40	99	16
Liq. Alumin. Acet.	15	14	30	59	77	57	50	60	167	79	309	49
Liq. Alumin. Subacet.	5	9	23	37	49	30	31	61	122	57	176	28
Liq. Antisept.	32	20	10	62	81	81	66	50	197	93	407	65
Liq. Aromat. Alk.	28	14	7	49	64	61	50	45	156	74	292	47
Liq. Aur. Brom. et Arsen.			2	2	3	1	7	49	57	27	32	5
Liq. Bism.	2		2	4	5	2	3	32	37	17	10	2
Liq. Calc. Sulphurat.	5	2	7	14	19	11	22	71	104	49	50	8
Liq. Carmin.			16	16	21	7	13	83	103	49	75	12
Liq. Chlor. Co.	1	9	3	13	17	1	11	50	62	29	44	7
Liq. Cocci	1	7	11	19	25	8	16	93	117	55	179	29
Liq. Ferr. Albumin.		1	3	4	5	2	13	37	52	24	34	5
Liq. Ferr. Cit.	1	3	13	17	22	3	8	41	52	24	50	8
Liq. Ferr. Pepton.		1	9	10	13	6	16	43	65	31	106	17
Liq. Ferr. Pepton. et Mangan.	5	7	24	36	47	40	57	60	157	74	284	46
Liq. Ferr. Salicyl.			3	3	4	2	5	28	35	16	10	2
Liq. Ferr. Subsulph.	3	8	30	41	54	9	32	91	132	62	104	17
Liq. Hydrastin. Co.			6	6	8	1	8	26	35	16	31	5

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Liq. Hypophos. Co.		4	15	19	25	15	20	48	83	39	49	8
Liq. Iodi et Zinc. Phenolsul.			3	3	4	3	3	9	15	7	12	2
Liq. Iodi Phenol.		5	5	10	13	6	7	41	54	25	50	8
Liq. Pancreat.			9	9	12		10	34	44	21	40	6
Liq. Pepsin.		2	9	11	14	1	10	45	56	26	42	7
Liq. Pepsin. Antisept.			7	7	9	1	6	12	19	9	7	1
Liq. Pepsin. Arom.		2	5	7	9	3	6	19	28	13	16	3
Liq. Phos. Acid.		1	9	10	13	4	9	33	46	22	32	5
Liq. Phos. Co.	1		9	10	13	2	10	22	34	16	8	1
Liq. Phosphor.			5	5	6		2	32	34	16	14	2
Liq. Pic. Carbon	3	5	13	21	27	8	16	51	75	35	92	15
Liq. Plum. Subacet. Dil.	4	9	29	42	55	30	53	89	172	81	302	48
Liq. Pot. Iod.	27	12	10	49	64	70	38	29	137	64	259	41
Liq. Procain. Hydroch.	15	4	9	28	37	12	21	41	74	35	37	6
Liq. Sod. et Menth.	2	1	14	17	22	8	20	37	65	31	58	9
Liq. Sod. Arsenat.	1	2	3	6	8	2	7	51	60	28	43	7
Liq. Sod. Arsenat. Dil.	1		2	3	4	5	9	29	43	20	29	5
Liq. Sod. Bor. Co.	17	11	9	37	49	60	25	29	114	54	142	23
Liq. Sod. Cit.	7	9	12	28	37	10	23	44	77	36	87	14
Liq. Sod. Phos. Co.	1	4	10	15	20	12	28	52	92	43	45	7
Lot. Alba Vet.			4	4	5		8	21	29	13	45	7
Lot. Ammon. Camph.			3	3	4	5	3	20	28	13	21	3
Lot. Calam.	35	22	6	63	82	108	52	22	182	85	545	87
Lot. Calam. Co.	22	8	12	42	55	70	50	33	153	72	212	34
Lot. Flav.	2	4	12	18	23	13	29	82	124	58	176	28
Lot. Nigr.	5	7	30	42	55	17	44	102	163	77	354	57
Lot. Plumb. et Opii	5	19	33	57	75	45	62	67	174	82	345	55
Magma Bism.	17	11	22	50	65	56	55	43	154	72	259	42
Mass. Copaib.	1		5	6	8	2	9	25	36	17	30	5
Mel Ros. et Sod. Bor.		1	8	9	12	1	12	36	49	23	90	14
Mel Sod. Bor.		1	7	8	10	2	8	35	45	21	98	16
Menthol Camph.	1	2	15	18	23	9	14	54	77	36	48	8
Mist. Adstring.		1	8	9	12	4	1	24	29	13	39	6
Mist. Carminat.			12	12	16	5	12	64	81	38	111	18
Mist. Chloral. et Pot. Brom. Co.	2	6	14	22	29	9	31	70	110	52	75	12
Mist. Chlorof. et Morph. Co.	1	2	3	6	8	5	8	23	36	17	11	2
Mist. Copaib.	2	6	6	14	19	28	32	70	130	61	238	38
Mist. Copaib. et Opii		3	1	4	5	3	6	15	24	11	27	4
Mist. Mag. Asafoet. et Opii			3	3	4	8	9	38	55	26	68	11
Mist. Ol. Balsam.			5	5	6		4	15	19	9	19	3
Mist. Opii et Chlorof. Co.			7	7	9	3	12	25	40	19	15	2
Mist. Opii et Rhei Co.			5	5	6	3	6	19	28	13	24	4
Mist. Pect.	5	1	15	21	27	13	21	60	94	44	137	22
Mist. Rhei Alk.		3	21	24	31	20	35	77	132	62	216	34
Mist. Rhei Co.	8	9	16	33	44	52	28	59	139	65	223	36
Mucil. Chondr.			6	6	8	5	9	38	52	24	41	7
Mucil. Sassaf. Medul.			3	3	4	1	2	15	18	8	14	2
Mull. Ac. Salicyl.			2	2	3		1	14	15	7	10	2
Mull. Creosot. Salicyl.				0		2		6	8	4	4	1
Mull. Hydrarg. Chlor. Corros.			1	1	1		1	5	6	3	7	1
Mull. Zinc.			1	1	1	1	1	10	12	6	7	1
Nebul. Arom.	3	3	14	20	26	10	25	53	88	41	108	17
Nebul. Eucalyptol	2	3	19	24	31	5	16	55	76	36	104	17
Nebul. Menthol.	4	7	19	30	40	14	25	51	90	42	141	23
Nebul. Menthol. Co.	7	9	19	35	46	13	32	54	99	47	129	21
Nebul. Thymol.	1	1	9	11	14	4	9	40	53	25	58	9
Odontalg.	1		4	5	6	1	4	21	26	12	12	2
Ol. Inf.			2	2	3	3	4	17	24	11	9	1
Oleat. Quin.				0			2	18	20	9	11	2
Oleat. Veratrin.			2	2	3			15	15	7	5	1

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Oleores. Cubeb.			5	5	6	2	17	71	90	42	69	11
Oleosacchara			6	6	8	10	12	56	78	37	74	12
Ol. Æther.		2	18	20	26	2	10	86	98	46	85	14
Ol. Hyoscy. Co.	1		6	7	9	4	9	42	55	26	54	9
Ol. Phenol.		1	11	12	16	2	15	57	74	35	58	9
Ol. Phosphorat.		1	11	12	16	4	12	59	75	35	56	9
Ol. Ricin. Arom.	4	3	12	19	25	23	41	79	143	67	277	44
Oxymel Scill.			2	2	3	1	5	25	31	14	35	5
Pastæ Dermatologicæ	4	7	10	21	27	18	12	38	68	32	76	12
Past. Betanaphth.	2		8	10	13	3	6	38	47	22	49	8
Past. Dextrin.	2		5	7	9	2	5	13	20	9	10	2
Past. Resorcin. Fort.	3	4	12	19	25	7	20	46	73	34	88	14
Past. Resorcin. Mit.	4	5	14	23	30	9	21	61	91	43	129	21
Past. Zinc.	12	16	20	48	62	45	46	57	148	70	277	44
Past. Zinc. Moll.	4	9	18	31	41	21	26	37	84	40	80	13
Past. Zinc. Sulphur.	2	1	12	15	20	4	12	25	41	19	30	5
Pepsin. Sacchar.		3	21	24	31	19	37	100	156	74	249	40
Petrox. Hydrarg.			3	3	4		2	10	12	6	6	1
Petrox. Liq.	2	1	11	14	19	6	19	37	62	29	65	10
Petroxolina Medicata			7	7	9						26	4
Petrox. Betanaphth.			4	4	5		1	11	12	6	4	1
Petrox. Bitum. Sulphon.			4	4	5		3	9	12	6	9	1
Petrox. Cadinum		2	4	6	8		3	7	10	5	8	1
Petrox. Chlorof. Camph.			6	6	8		3	10	13	6	7	1
Petrox. Eucalyptolis			5	5	6		1	8	9	4	6	1
Petrox. Guaiacolis			6	6	8		2	17	19	9	16	3
Petrox. Iodi			12	12	16	9	18	36	63	30	97	16
Petrox. Iodi Dil.		1	9	10	13	7	13	25	45	21	43	7
Petrox. Mentholis			8	8	10	1	8	19	28	13	14	2
Petrox. Methyl. Salicyl.	1		8	9	12	4	10	27	41	19	18	3
Petrox. Phenolis		1	7	8	10	1	4	16	21	10	15	3
Petrox. Phenol. Camph.			6	6	8		4	10	14	7	12	2
Petrox. Sulphurat.			2	2	3		2	11	13	7	7	1
Petrox. Sulphurat. Co.			2	2	3		2	5	7	3	6	1
Petrox. Spissum		1	6	7	9	4	5	20	29	13	15	3
Phenol Iodat.		1	10	11	14	4	4	52	60	29	34	5
Pil. Aloe. et Asafoet.		1	11	12	16	3	8	73	84	40	126	20
Pil. Aloe. et Ferr.			8	8	10	3	5	67	75	35	61	10
Pil. Aloe. et Mastich.	3	4	9	16	21	15	22	76	113	53	93	15
Pil. Aloe. et Myrrh.		1	12	13	17	4	14	78	96	45	102	17
Pil. Aloe. et Podoph. Co.	1	1	9	11	14	3	9	45	57	27	50	8
Pil. Aloe. Hydrarg. et Podoph.			6	6	8		3	30	33	15	30	5
Pil. Aloin. Co.	1	2	12	15	20	7	17	53	77	36	94	15
Pil. A. S. et B.	11	21	25	57	75	41	59	72	172	81	310	50
Pil. A. S. et B. Co.	8	16	18	42	55	42	41	68	151	71	254	41
Pil. Antiperiod.			5	5	6	5	19	67	91	43	116	19
Pil. Antiperiod. s. Aloe			5	5	6	8	13	52	73	34	62	10
Pil. Cathart. Veget.	10	11	25	46	60	40	60	68	168	79	320	51
Pil. Digit., Scill. et Hydrarg.	1	4	22	27	36	6	22	61	89	42	70	11
Pil. Ferr. Iod.	1	2	14	17	22	5	23	70	98	46	88	14
Pil. Ferr. Quin. Aloe. et Nuc. Vom.	1		7	8	10	3	10	39	52	24	53	8
Pil. Ferr. Quin. Strych. et Arsen. F.	1	1	14	16	21	4	25	48	77	36	71	11
Pil. Ferr. Quin. Strych. et Arsen. Mit.	1	3	13	17	22	9	20	56	85	40	68	11
Pil. Lax. Co.	2	7	6	15	20	15	19	47	81	38	110	18
Pil. Opii, Digit. et Quin.		2	4	6	8	3	6	21	30	14	7	1
Pil. Opii et Camph.			13	13	17		8	53	61	29	18	3
Pil. Opii et Plumb.		5	20	25	33	2	15	63	80	38	30	5
Pil. Rhei.	1	2	14	17	22	6	26	54	86	40	94	15
Pil. Rhei Co.	4	5	20	29	38	15	20	67	102	48	148	24
Pulv. Acetanil. Co.	2		23	25	33	11	32	90	133	63	194	31

Abbreviated Name of Preparation.	Hospital Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Prescription Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using	Drug Stores. Total using.	Per cent using.
Pulv. Aloe. et Canell.			5	5	6	1	6	49	56	26	69	11
Pulv. Antimon.			1	1	1		1	20	21	10	18	3
Pulv. Antisept.	6	8	17	31	41	52	59	57	168	79	299	48
Pulv. Arom.	1	2	27	30	40	8	40	113	161	76	256	41
Pulv. Arom. Rubefac.			4	4	5		5	15	20	9	15	3
Pulv. Cret. Arom.		4	19	23	30	6	18	83	107	50	111	18
Pulv. Cret. et Opii Arom.		2	5	7	9		3	23	26	12	19	3
Pulv. Hydrarg. Chlor. Mit. et Jalap.		3	4	7	9	1	4	26	31	14	45	7
Pulv. Myric. Co.			1	1	1	1	1	15	17	8	10	2
Pulv. Pancreat. Co.	1	3	10	14	19	2	8	26	36	17	14	3
Pulv. Rhei et Magnes. Anis.		2	3	5	6	1	5	32	38	18	12	2
Pulv. Talc. Co.		2	8	10	13	5	9	27	41	19	19	3
Sal. Carol. Fact.		7	24	31	41	16	31	83	130	61	182	29
Sal. Carol. Fact. Eff.	2	4	11	17	22	8	25	79	112	53	94	15
Sal. Kissingen. Fact.		2	11	13	17	4	20	71	95	45	99	16
Sal. Kissingen. Fact. Eff.		2	7	9	12	4	19	84	107	50	81	13
Sal. Lith. Cit. Eff.		4	10	14	19	4	15	87	106	50	62	10
Sal. Mag. Sulph. Eff.	4	1	10	15	20	7	17	88	112	53	94	15
Sal. Pot. Brom. Eff. Co.	2	2	6	10	13	3	5	58	66	31	39	6
Sal. Vichy. Fact.	2	4	5	11	14	8	13	79	100	47	112	18
Sal. Vichy. Fact. Eff.	2	4	5	11	14	8	15	87	110	52	93	15
Sev. Benz.			1	1	1	2	4	16	22	10		
Sol. Mastic. Chlorof. Co.			2	2	3			4	4	2	4	1
Sol. Resin. Chlorof.			2	2	3		2	10	12	6	5	1
Spec. Emoll.			2	2	3	3	2	11	16	7	6	1
Spec. Lax.			1	1	1	5	6	21	32	15	25	4
Spec. Pect.		1		1	1	8	7	21	36	17	57	9
Sp. Ac. Formic.	1	4	20	25	33	13	19	113	145	68	121	19
Sp. Ætheris		9	31	40	52	7	35	101	143	67	168	27
Sp. Æth. Co.	2	15	46	63	82	11	59	115	185	87	358	57
Sp. Ammon. Anis.	2	6	19	27	36	19	17	87	123	58	199	31
Sp. Amydg. Amar.	1	6	24	31	41	3	27	91	121	57	174	28
Sp. Card. Co.	2	3	16	21	27	7	23	64	94	44	116	18
Sp. Myrciæ Co.		4	19	23	30	32	32	56	120	57	72	12
Sp. Odorat.		1	6	7	9	8	19	44	71	33	56	9
Sp. Oleorum Volatilium		1	12	13	17	4	10	46	60	28	41	7
Sp. Sinap.		1	3	4	5	2	5	36	43	20	42	7
Sp. Vanil. Co.		1	10	11	14	6	9	25	40	19	41	7
Stil. Medic.			3	3	4	3	4	14	21	10	31	5
Stil. Acid. Salicyl.			4	4	5	2		13	15	7	13	2
Sulphur. Iod.			1	1	1	1	2	23	26	12	10	2
Supp. Boroglycerini	1	7	17	25	33	26	39	67	132	62	105	17
Syr. Allii			2	2	3	1	6	13	20	9	21	3
Syr. Althæ.			3	3	4	3	12	60	75	35	54	9
Syr. Ammon. Hypophos.	1	4	14	19	25	16	32	72	120	56	108	17
Syr. Asar. Co.			5	5	6	6	17	42	65	31	49	8
Syrup Bromidor.	3	7	10	20	26	31	32	51	114	54	176	28
Syr. Cacao		2	6	8	10	6	11	25	42	20	24	4
Syr. Calc. et Sod. Hypophos.	2	4	17	23	30	16	28	72	116	55	126	21
Syr. Calc. Hypophos.		3	12	15	20	8	22	63	93	44	96	15
Syr. Calc. Iodid.			9	9	12	3	14	51	68	32	38	6
Syr. Calc. Lactophos.	1	3	22	26	34	10	37	91	138	65	164	26
Syr. Calc. Lactophos. et Ferr.			6	6	8	6	12	39	57	27	24	4
Syr. Cinnam.		2	7	9	12	3	11	37	51	24	19	3
Syr. Eriodict. Arom.		1	19	20	26	10	26	66	102	48	93	15
Syr. Ferr. Quin. et Strych. Phos.			12	12	16	2	9	67	78	37	61	10
Syr. Ferr. Sacch. Sol.			3	3	4	2	3	22	27	12	13	2
Syr. Ficor. Co.		2	5	7	9	9	14	26	49	23	90	14
Syr. Glycyrrhiz.	3	6	31	40	52	29	44	86	159	75	248	40
Syr. Hypophos.		6	31	37	49	34	54	59	147	69	210	34
Syr. Hypophos. Co.	3	17	25	45	59	72	56	55	183	86	434	69
Syr. Iodotan.		1		1	1	2	3	16	21	10	14	2
Syr. Ipecac. et Opii		1	15	16	21	2	22	59	83	39	82	13

Abbreviated Name of Preparation.	Hospital Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Prescription Pharmacies. Extent of Use. Large.	Med.	Small.	Total using.	Per cent using.	Drug Stores. Total using.	Per cent using.
Syr. Kramer.			2	2	3		2	28	30	14	15	3
Syr. Mann.			1	1	1		1	30	31	14	15	3
Syr. Phos. Co.	1		3	4	5	2	7	40	49	23	27	4
Syr. Phos. c. Quin. et Strych.		1	8	9	12	5	7	43	55	26	46	7
Syr. Pin. Alb. Co.	9	11	33	53	70	74	59	59	192	90	438	70
Syr. Pin. Alb. c. Morph.	1		7	8	10	16	21	49	86	40	78	12
Syr. Quinid.			2	2	3	3		20	23	11	28	4
Syr. Rham. Cathart.			2	2	3	2	14	35	51	24	50	8
Syr. Ros.		2	3	5	6		4	16	20	9	11	2
Syr. Rubi		2	6	8	10	4	10	47	61	29	37	6
Syr. Rubi Id.	2	5	20	27	36	28	37	90	155	73	238	38
Syr. Senn. Arom.	2		11	13	17	7	18	46	71	33	73	12
Syr. Stilling. Co.		1	5	6	8	4	18	55	77	36	72	12
Syr. Thymi		1	6	7	9	6	8	40	54	25	72	12
Syr. Thymi Co.		1	3	4	5	6	6	36	48	22	55	9
Syr. Trifol. Co.		1	11	12	16	28	52	72	152	72	138	22
Tab. Carb. Anim.		5	22	27	36	12	20	33	65	31	99	16
Tab. Hydrarg. Chlor. Mit.	13	16	32	62	81	72	61	39	172	81	321	52
Tab. Phenolphthal.	12	16	32	60	79	37	58	74	169	80	259	42
Tab. Santonin.		1	2	3	4	22	34	98	154	73	324	52
Tab. Santonin. Co.	1	3	15	19	25	17	29	69	105	49	147	23
Tab. Sod. Bicarb.	35	13	14	62	81	64	56	53	173	81	337	54
Tab. Sulphur. et Pot. Bitart.		3	14	17	22	50	50	66	166	78	277	44
Tr. Aloes		1	23	24	31	11	36	123	170	80	347	55
Tr. Aloe. et Myrrh.			17	17	22	5	23	114	142	67	239	38
Tr. Amar.			5	5	6		6	52	58	27	50	8
Tr. Antimon.		2	7	9	12	1	6	35	42	20	60	10
Tr. Antiperiod.		1	3	4	5	5	18	42	62	29	123	20
Tr. Antiperiod. s. Aloe		1	6	7	9	6	15	45	66	31	95	15
Tr. Arnic.	1	5	40	46	60	53	87	60	200	94	505	81
Tr. Aromatica			8	8	10	3	12	56	71	33	67	11
Tr. Bryon.		2	12	14	19	8	17	84	109	51	153	24
Tr. Cact. Grand.		1	10	11	14	6	12	78	96	45	86	13
Tr. Calend.			13	13	17	5	16	80	101	48	88	14
Tr. Capsic. et Myrrh.		1	6	7	9	3	20	89	112	53	133	21
Tr. Cimicif.		1	13	14	19	7	26	103	136	64	193	30
Tr. Cinnam.		1	12	13	17	4	17	92	113	53	132	21
Tr. Coccul.	1	1	9	11	14	2	10	58	70	33	44	7
Tr. Colch. Corm. Fort.			19	19	25	7	15	65	87	41	52	8
Tr. Croci		1	6	7	9	3	5	28	36	17	22	3
Tr. Cubeb.		3	7	10	13	3	18	75	96	45	92	15
Tr. Delphin.	10	14	28	52	68	37	60	65	162	76	313	50
Tr. Ferr. Chlor. Aeth.	1	4	6	11	14	7	25	37	69	32	45	7
Tr. Ferr. Citrochlor.	5	10	19	34	45	14	39	76	129	61	244	39
Tr. Ferr. Pomat.			5	5	6	2	12	42	56	26	48	8
Tr. Gall.			8	8	10	2	5	48	55	26	26	4
Tr. Gelsem.		7	37	44	57	16	57	106	179	84	280	45
Tr. Guaiac.		2	28	30	40	12	39	108	159	75	226	37
Tr. Guaiac. Ammon.	1	3	24	28	37	13	43	110	166	78	269	43
Tr. Guaiac. Co.		1	11	12	16	2	16	54	72	34	34	5
Tr. Humul.			3	3	4	3	11	50	64	30	46	7
Tr. Hydrast.		1	30	31	41	12	30	96	138	65	226	36
Tr. Ignat.			7	7	9	3	6	50	59	28	27	4
Tr. Iodidor.	2		6	8	10	13	17	32	62	29	79	13
Tr. Iod. Fort.	7	8	14	29	38	18	26	77	121	57	169	27
Tinct. Ipecac.		1	18	19	25	3	17	70	90	42	113	18
Tr. Ipecac. et Opii		1	13	14	19	4	17	76	97	46	86	14
Tr. Jalap.		1	15	16	21	2	8	74	84	40	51	8
Tr. Jalap. Co.			10	10	13	1	4	55	60	28	35	6
Tr. Opii Crocat.				0			1	18	19	9	8	1
Tr. Opii et Gambir Co.			1	1	1		4	14	18	8	25	4
Tr. Passiflor.		3	3	6	8	3	9	43	55	26	50	8

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Tr. Persion	4	10	35	49	64	23	38	101	162	76	295	47
Tr. Persion. Co.	1	8	23	32	42	11	41	76	128	60	232	37
Tr. Pulsatil.	1		9	10	13	4	14	89	107	50	93	15
Tr. Quas.		3	16	19	25	1	17	106	130	61	145	23
Tr. Quillaj.		1	12	13	17	3	17	67	87	41	65	10
Tr. Rhei Aq.			5	5	6		8	41	49	23	35	6
Tr. Rhei Dulc.		3	7	10	13	3	13	68	84	40	107	17
Tr. Rhei et Gent.		2	5	7	9	2	4	28	34	16	29	5
Tr. Sabal et Santal.	1	3	7	11	14	4	6	40	50	23	63	10
Tr. Sanguin.			21	21	27	6	12	116	134	63	143	23
Tr. Serpent.			11	11	14	3	11	82	96	45	75	12
Tr. Sumbul		1	8	9	12	5	14	55	74	35	55	9
Tr. Vanill.	6	11	18	35	46	43	37	69	149	70	231	37
Tr. Viburn. Opul. Co.	1	5	18	24	31	12	22	65	99	47	134	22
Tr. Æthereæ			3	3	4	1	10	42	53	25	24	4
Tr. Medicamentorum Recentium		1	6	7	9	3	13	36	52	25	33	5
Troch. Eucalypt. Gum.			4	4	5	1	5	26	32	15	13	2
Troch. Ulmi		2	10	12	16	9	9	55	73	34	34	5
Ung. Bitum. Sulphon.	10	1	9	20	26	23	10	18	51	24	39	6
Ung. Calamin.	5	4	18	27	36	16	39	82	137	64	209	33
Ung. Camph.	4	1	14	19	25	8	11	53	72	34	90	14
Ung. Capsic.		4	14	18	23	4	9	54	67	31	100	16
Ung. Fusc.		3	3	6	8	5	7	28	40	19	49	8
Ung. Hydrarg. Chlor. Mit.		12	40	52	68	13	43	94	150	71	264	42
Ung. Hydrarg. Nit.		2	20	22	29	3	27	118	148	70	127	20
Ung. Hydrarg. Oxid. Rub.		3	19	22	29	8	19	108	135	63	200	32
Ung. Iod. Denig.	2	8	10	20	26	13	25	53	91	43	165	26
Ung. Pic. Co.	1	4	28	33	44	13	16	82	111	52	140	23
Ung. Plumb. Iod.		2	6	8	10	3	12	54	69	32	40	6
Ung. Pot. Iod.		1	8	9	12		12	67	79	36	82	13
Ung. Resorcin. Co.	2	8	35	45	59	28	61	77	166	78	337	54
Ung. Sinap.		3	11	14	19	4	16	47	67	31	86	14
Ung. Stramon.	1		19	20	26	3	19	81	103	49	108	17
Ung. Sulphur. Alk.		2	13	15	20	7	14	44	65	30	50	8
Ung. Sulphur. Co.	5	3	20	28	37	19	36	81	136	64	197	31
Ung. Veratrin.			5	5	6	2	5	32	39	18	29	5
Ung. Zinc. Stear.	2	2	9	13	17	1	10	60	71	33	115	18

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H. A. Langenhan, Seattle, Wash.
Henry G. Ruenzel, Milwaukee, Wis.

PREPARATIONS FOR THE AMERICAN PHARMACEUTICAL ASSOCIATION CONVENTION.

An A. PH. A. Committee consisting of President H. C. Christensen, of Chicago, Secretary E. F. Kelly, of Baltimore, and J. H. Beal, of Camp Walton, Florida, met with Local Secretary G. H. Grommet and the Local Committee of Arrangements at Miami, January 27th and 28th, to consider arrangements for the 79th annual meeting of the ASOCIATION, which is to be held in Miami in July next.

Three busy sessions were devoted to consideration of the Program and the adjustment of the regular work of the Convention to the entertainment features to be tendered by the Florida State Pharmaceutical Association and Miami Druggists and the Travelers' Auxiliary of Florida Pharmaceutical Association.

Conferring in Miami.

Left to right—John K. Clemmer, W. M. Hankins, *President*, N. A. B. P.; H. Christensen, *President*, A. PH. A.; G. E. Burwell, *Chairman* of publicity; E. F. Kelly, *Secretary*, A. PH. A.; G. H. Grommet, *Local Secretary*.

The Local Committee has the work well in hand and many interesting entertainments are in store for those who attend the convention. One of the special features will be a banquet under the palms in the Patio of the Miami Country Club, the menu to consist entirely of Florida products, including such items as Florida lobster, stone crabs, jumbo shrimp and pompano from nearby waters, avocado and papaya salads, mangoes and other tropical fruits and products. Another entertainment will be an All Dixie Concert to be given in the evening among the palms of Biscayne Park.

Headquarters will be the beautiful and modern Columbus Hotel, over-looking Biscayne Park with its palms and tropical plants, and beautiful Biscayne Bay, with Miami Beach and other islands in the distance. All of these will be in plain view from most of the rooms in which the various sessions will be held.

Arrangements are being made for the botanically minded members to visit various tropical gardens in the Miami area, where many thousands of foreign palms and other tropical plants are cultivated.

It is expected that various parties will come from the New England States and from New York and Baltimore by steamship. Another party is spoken of as likely to come from San Francisco by way of the Panama Canal. Many others will make the trip by auto, and will have the opportunity of seeing some of the beautiful towns and cities located on the splendid highways to be found on both the East and West Coasts of the Florida Peninsula. Extremely favorable railroad rates have been secured, and many northern druggists will be able to see the beauties of South Florida at extremely low cost.

On Saturday those intending to take the Cuban Tour will leave for Key West over the Key West Extension of the Florida East Coast Railway, affording the visitors the novelty of going to sea in a perfectly appointed Pullman train. For many miles the course will be out of sight of land on either side of the railroad. At Key West the party will embark in an ocean-going steamer for Havana. Three days will be spent in touring that city and some of the more interesting portions of the Island of Cuba. The trip is planned to cover five days between leaving and the return to Miami. The cost of the entire tour will be quite moderate.

Numerous inquiries as to routes and rates indicate an unusually large attendance at the Convention.

On Tuesday evening the visiting Committee, the Local Committee and other Miami druggists were entertained at a banquet at the Alcazar Hotel by the local jobbing interests supplying the Florida drug trade. About seventy were in attendance. Talks were made by the visitors and others relating to the coming convention.

After the Committee had finished its labors, pharmacists John K. Clemmer and A. Finstad treated the three visiting members of the ASSOCIATION to a deep sea fishing excursion in the waters of the Gulf Stream, about 25 miles from the city of Miami. President Christensen and Secretary Kelly especially distinguished themselves by the capture of numerous fine specimens of King Fish, Dolphin and Bonita. Secretary Kelly also captured a good sized individual of the rather rare fish known as the "shark's valet," and also succeeded in catching several of the boats of the fishing fleet in the vicinity, but did not succeed in landing any of them.

Before returning North, President Christensen and Secretary Kelly attended meetings of druggists in the cities of Jacksonville, Tampa and St. Petersburg, where much interest in the coming Convention was in evidence.

NATIONAL ADVISORY HEALTH COUNCIL.

The members of the New National Advisory Health Council, created by an act of Congress to advise with the Surgeon General of the U. S. Public Health Service on matters pertaining to the health of the country at large, have been appointed. Four members of the advisory committee of the old Hygienic Laboratory who will serve on the council are: Dr. Simon Flexner, director of the Rockefeller Institute for Medical Research; Dr. M. P. Ravenel, professor of bacteriology at the University of Missouri; Dr. M. J. Rosenau, professor of public health and hygiene at the Harvard Medical School, and Dr. William H. Welch, of the Johns Hopkins University. The other members are: Dr. W. S. Leathers, dean of Vanderbilt University School of Medicine; Dr. Haven Emerson, professor of public health and hygiene at Columbia University; Professor S. C. Lind, head of the department of chemistry, University of Minnesota; Dr. W. H. Howell, director of the Johns Hopkins School of Hygiene; Dr. C. E. A. Winslow, professor of public health at Yale University, and Dr. Alfred Stengel, professor of the practice of medicine at the University of Pennsylvania.

CANADIAN PHARMACEUTICAL ASSOCIATION TO MEET IN WINNIPEG.

Preparations are being made for the reception and entertainment of delegates and others to the nineteenth annual convention of the Canadian Pharmaceutical Association, to be held at Winnipeg, Manitoba, August 4–7, 1931. The city of Winnipeg is favorably situated, being readily accessible from all directions. The local committee, of which H. D. Campbell is chairman, is engaged in formulating plans for the big event. A special invitation is extended to pharmacists of the United States and in view of the joint meeting of the A. PH. A. and the C. Ph. A. to be held in Toronto in 1932 a large number of U. S. pharmacists from the adjacent states, especially, is expected to attend. Joseph Wilder, 440 Notre Dame Ave., Winnipeg, Chairman of Publicity, will be glad to furnish further details.

ASSOCIATION BUSINESS

THE COUNCIL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, 1930–1931.

Office of the Secretary, 10 West Chase St., Baltimore, Md.

LETTER NO. 7.

January 26, 1931.

To the Members of the Council:

74. Budget for 1931. Motion No. 21 (see Council Letter No. 6, page 71) has been carried and the budget is approved.

75. Selection of Auditors. Motion No. 22 (see Council Letter No. 6, page 72) has been carried and W. A. Johnson & Co. will audit the account for 1930.

76. Contract for Printing and Mailing the Journal for 1931. Motion No. 23 (see Council Letter No. 6, page 72) has been carried and the contract is awarded to the Mack Printing Co.

77. Election of Members. Motion No. 24 (see Council Letter No. 6, page 72) has been carried and applicants numbered 110 to 161, inclusive, are declared elected.

78. Applicants for Membership. The following applications properly endorsed and accompanied by the first year's dues have been received:

No. 162, R. David Allen, 256 Warren Ave., Kenmore, N. Y.; No. 163, M. Charles Bees, 1417 Huron Ave., New Castle, Pa.; No. 164, H. B. Birdsall, 6601 Tireman Ave., Detroit, Mich.; No. 165, James M. Coake, 509 Genesee Bldg., Buffalo, N. Y.; No. 166, George W. Colborn, Jr., 355 Somerset St., Princess Anne, Md.; No. 167, Robert J. Davison, 72 Cheltenham Drive, Buffalo, N. Y.; No. 168, John B. Earl, Cairo, N. Y.; No. 169, Sutematsu Endo, P. O. Box 1015, Honolulu, Hawaii; No. 170, John A. Faessel, Jr., 1336 Juinata St., Pittsburgh, Pa.; No. 171, Wilfred K. Gates, Marion, Kansas; No. 172, Robert W. Gaw, 506 Penn Ave., Pittsburgh, Pa.; No. 173, Robert Clark Giffen, 1235 Randolph St., N. W., Washington, D. C.; No. 174, Felix J. Goetz, 8946 Tireman Ave., Detroit, Mich.; No. 175, Walter August Hankammer, 8801 W. Pico St., Los Angeles, Cal.; No. 176, Clyde M. Isenberg, 1106 Twenty-First Ave., Altoona, Pa.; No. 177, Emil B. Kolbe, 5705 Vernor Highway, W., Detroit, Mich.; No. 178, L. J. Klotz, 1800 Wheat St., Columbia, S. C.; No. 179, Alf. M. Langhus, 714 W. Dayton St., Madison, Wis.; No. 180, Philip E. Lazzari, Box 371, Monongahela, Pa.; No. 181, A. Lichterman, 137 Pelham Road, New Rochelle, N. Y.; No. 182, Charles S. Loewenstein, 1800 Amsterdam Ave., New York, N. Y.; No. 183, Neil McFayden, Methodist Sanitarium, Albuquerque, N. M.; No. 184, A. L. Maxsin, 723 No. 70th St., Seattle, Wash.; No. 185, Minnie M. Meyer, 411 N. Murray St., Madison, Wis.; No. 186, John M. Moore, 101 W. Fayette St., Uniontown, Pa.; No. 187, L. D. Moss, 7444 Tireman Ave., Detroit, Mich.; No. 188, Leslie M. Ohmart, 16 Stearns Ave., Medford, Mass.; No. 189, R. J. Pauly, 803 State St., Madison, Wis.; No. 190, Edward J. Pszcaoikowski, 5032 Moran St., Detroit, Mich.; No. 191, Mildred Irene Rickard (Mrs.), 917 Bryn Mawr Rd., Pittsburgh, Pa.; No. 192, W. H. Ryan, Mgr., The Bullard & Shedd Co., Keene, N. H.; No. 193, Meyer Samson, 1642 Spruce St., Philadelphia, Pa.; No. 194, Norbert C. Schaller, Dyer, Indiana; No. 195, Henry Seydler, East Bernard, Texas; No. 196, Frank S. Sleder, 5471 Chene St., Detroit, Mich.; No. 197, Karl Smither, 2339 Main St., Buffalo, N. Y.; No. 198, Albert Wm. Stahel, 1302 F St., Eureka, Calif.; No. 199, Edwin B. Steever, 35 Divinity St., Pittsburgh, Pa.; No. 200, H. O. Stewart, 1930 H St., Eureka, Calif.; No. 201, David Stolz, 335 S. Warren St., Syracuse, N. Y.; No. 202, John Theil, 1700 Mansfield Rd., Pittsburgh, Pa.; No. 203, Linwood F. Tice, c/o Baylor College of Pharmacy, Dallas, Texas; No. 204, H. L. Tisher, Purdue University, School of Pharmacy, Lafayette, Indiana; No. 205, E. P. Tobin, 7444 W. Jefferson Ave., Detroit, Mich.; No. 206, Harold F. Waite, The McGee Drug Co., Dalhart, Texas; No. 207, Willard Wells, 6th and F Sts., Eureka, Calif.

(*Motion No. 25*) *Vote on applications for active membership in the American Pharmaceutical Association.*

79. Applicant for Membership on Account of Contribution to the Headquarters Building Fund. The following non-member of the A. PH. A. has pledged $25.00 or more to the Headquarters Building Fund and has made a cash payment of $5.00 or more. He is entitled to membership and you are requested

to vote on the application which has been properly endorsed.

H-17, William McKee, 209 Boulder Ave., Joliet, Ill.

(*Motion No. 26*) *Vote on application of contributor to the Headquarters Building Fund for membership in the American Pharmaceutical Association.*

80. Life Membership. Daniel J. Fink has become a Life Member through the payment of $25.00.

81. Life Membership. The following have become Life Members through the payment of dues for thirty-seven consecutive years:

W. H. Bradbury, Washington, D. C.
Addison Dimmitt, Louisville, Ky.
W. A. Hover, Denver, Colo.
William C. Powell, Snow Hill, Md.
William Votteler, Louisville, Ky.

82. Report of the Auditors. The following report has been submitted:

January 23, 1931.

Mr. C. W. Holton, Treasurer,
AMERICAN PHARMACEUTICAL ASSOCIATION,
Baltimore, Maryland.

Dear Sir:

I have made an examination of the books and accounts of the AMERICAN PHARMACEUTICAL ASSOCIATION and your report, as Treasurer, for the calendar year 1930, and I HEREBY CERTIFY that the total Cash and Securities on hand at December 31, 1930, amounting to $542,989.85, is correctly stated.

Real Estate, including advance payments on architect's fees, represents a cost of $99,605.40 which with the Cash and Securities aggregates $642,595.25.

All cash receipts have been traced to deposits in bank to the credit of the respective funds for which received, and all disbursements have been found evidenced by properly authorized voucher checks.

Balances on deposit with the various Banks have been reconciled with Certificates from the Depositories, and Investment Securities held by the ASSOCIATION have been examined and found to be in agreement with accounts shown by the records.

Interest accruing on bonds held by the various trust accounts has been promptly collected on their due dates and deposited to the proper fund account.

Records maintained by the Secretary of the ASSOCIATION have been examined and transfers of funds from his account to that of the Treasurer have been verified.

Respectfully submitted,
(Signed) W. A. Johnson,
Certified Public Accountant.

In order that the members of the Council and others interested may be informed, the following data is quoted from the Treasurer's Report for the year:

January 1 to December 31, 1930.

BALANCE AND RECEIPTS.

BALANCE.

Cash in Merchants & Newark Trust Co., Newark, N. J.	$ 1,320.76	
Cash in Boston Penny Savings Bank	336.06	
Total Balance, January 1, 1930		$ 1,656.82

RECEIPTS.

For the Current Fund.		
From the Secretary (see account attached)	$37,288.12	
Interest on Deposit Boston Penny Savings Bank	17.00	
Interest on Deposit Merchants and Newark Trust Co	52.29	
Interest on Headquarters Building Fund	15,278.45	
Total Receipts for the Current Fund		$52,635.86

For the Permanent Funds.

Endowment	$ 540.34		
Centennial	189.67		
Ebert Legacy	260.99		
Ebert Legacy (Sale of Bond)	2,000.00		
Ebert Prize	43.85		
Life Membership	1,770.68		
Research	6,906.92		
Headquarters Building	52,675.01		
Total Receipts for the Permanent Funds		$64,387.46	
For the Trust Funds.			
Wm. Proctor, Jr., Monument	$ 592.61		
J. P. Remington Honor Medal	49.25		
Total Receipts for the Trust Funds		$ 641.86	
Total Receipts			$117,665.18
Total Balance and Receipts			$119,322.00

DISBURSEMENTS AND BALANCE.

From the Current Fund.

GENERAL EXPENSES.

	Budget appropriations.	Budget disbursements.
Salaries	$ 11,700.00	$ 11,699.92
Rent	1,020.00	1,020.00
Telegraph and Telephone	200.00	180.49
Clerical Expenses	1,500.00	1,205.00
Printing, Postage and Stationery	1,300.00	1,198.94
Office Supplies	150.00	166.23
Traveling Expenses	1,300.00	846.76
Premium on Bonds	60.00	50.00
Auditing	75.00	75.00
Certificates	50.00	3.00
Miscellaneous	150.00	63.07
Scientific Section	25.00	41.89
Section on Education and Legislation	25.00	7.81
Section on Practical Pharmacy and Dispensing	25.00	15.43
Section on Commercial Interests	25.00	10.00
Section on Historical Pharmacy	25.00	10.00
Commission on Proprietary Medicines	50.00	
Committee on Local Branches	25.00	
Committee on Membership	1,000.00	223.44
Committee on Legislation	100.00	
Committee on Syllabus	50.00	50.00
Committee on Unofficial Standards	100.00	122.04
Committee on Colored Glass Containers	50.00	
Drug Trade Bureau of Public Information	400.00	400.00
International Pharmaceutical Federation	120.00	
Metric Association	10.00	10.00
American Conference on Hospital Service	25.00	
Headquarters Building Campaign	4,000.00	1,031.25

Year Book	4,500.00	5,001.04
Library	100.00	4.36
Committee on Pharmacy Week	250.00	250.00
Total Appropriation for General Expenses	$ 28,410.00	
Total Disbursements for General Expenses		$ 23,685.67

OPEN ACCOUNTS.

JOURNAL	$ 11,000.00	$ 15,424.35
National Formulary	1,000.00	6,123.32
Recipe Book	1,000.00	
Badges and Bars	50.00	
Total Budget Appropriations	$ 41,460.00	
Total Budget Disbursements		$ 45,233.34
Transfer of one-half net profits of National Formulary for 1930 to Research Fund		4,580.90
Total Disbursements from Current Fund by Voucher Check		$ 49,814.24

From the Permanent Funds.

Ebert Legacy, Purchase of Bond	$ 2,267.46		
Ebert Prize, Medal for 1930	50.20		
Ebert Prize, Bank Charge	1.00		
Life Membership, Purchase of Bonds	1,985.27		
Research, Purchase of Bond	1,014.19		
Research, Award for 1930–1931	500.00		
Research, Nat. Conference on Pharmaceutical Research	25.00		
Research, Expenses	34.92		
Headquarters Bldg., Advance Payments on Architect's Fees	3,752.07		
Headquarters Bldg., Transfer of Interest to Checking Acc't	15,278.45		
Headquarters Building, Checks Returned	75.00		
Headquarters Bldg., Taxes	560.42		
Headquarters Bldg., Advance Payments on Property in Square 62, Washington, D. C.	3,000.00		
Total Disbursements from Permanent Funds by Voucher Checks and Charges		$ 28,543.98	
Total Net Credits to Permanent Funds		35,843.48	
Total Disbursements for Permanent Funds			$ 64,387.46

From the Trust Funds.

Remington Honor Medal, Medal for 1930	$35.00		
Total Disbursements from Trust Funds by Voucher Check	$35.00		
Total Net Credits to Trust Funds	606.86		
Total Disbursements for Trust Funds			$641.86
Total Disbursements			$114,843.56

BALANCE IN CURRENT FUND.

Cash in Merchants and Newark Trust Co.	$ 4,125.38	
Cash in Boston Penny Savings Bank	353.06	
Total Balance in Current Fund, December 31, 1930		$ 4,478.44
Total Disbursements and Balance		$119,322.00

COMPARISON OF FUNDS.

Current Fund.	Dec. 31, 1929.	Dec. 31, 1930.
Cash in Merchants & Newark Trust Co.	$ 1,320.76	$ 4,125.38
Cash in Boston Penny Savings Bank	336.06	353.06
Total Current Fund	$ 1,656.82	$ 4,478.44
Permanent Funds.		
Endowment Fund	$ 12,995.69	$ 13,536.03
Centennial Fund	4,975.74	5,165.41
Ebert Legacy Fund	7,365.51	7,359.04
Ebert Prize Fund	1,075.34	1,067.99
Life Membership Fund	37,569.19	39,354.60
Research Fund	54,300.89	60,633.70
Headquarters Building Fund	457,469.19	494,230.33
Total Permanent Funds	$575,751.55	$621,347.10
Trust Funds.		
Wm. Procter, Jr., Monument Fund	$ 14,847.79	$ 15,440.40
Jos. P. Remington Honor Medal Fund	1,315.06	1,329.31
Total Trust Funds	$ 16,162.85	$ 16,769.71

SUMMARY OF FUNDS.

Current Fund	$ 1,656.82	$ 4,478.44
Permanent Funds	575,751.55	621,347.10
Trust Funds	16,162.85	16,769.71
Total Funds	$593,571.22	$642,595.25

SUMMARY OF ASSETS AND TRUST FUNDS.

	Dec. 31, 1927.	Dec. 31, 1928.	Dec. 31, 1929.	Dec. 31, 1930.
Current Fund	$ 4,119.65	$ 770.44	$ 1,656.82	$ 4,478.44
Permanent Funds	369,565.88	473,907.94	575,751.55	621,347.10
Total Assets	$373,685.53	$474,678.38	$577,408.37	$625,825.54
Trust Funds	15,061.56	15,631.60	16,162.85	16,769.71
Total Funds	$388,747.09	$490,309.98	$593,571.22	$642,595.25

83. Investment of Funds. Treasurer Holton reports the purchase for the Research Fund of five $1000 City of Chattanooga, Tenn. Bonds, 4¾%, due August 1, 1959, at 105.66 and accrued interest, and of one $1000 State of Tennessee Bond, 4¼%, due July 1, 1938, at 100.25 and accrued interest. This brings the securities held for this fund to a total of $60,000.

84. Purchase of Property. Chairman Dunning of the Headquarters Building Campaign Committee reports the purchase of Lots 7, 12, 13, 14 and 15 in Square 62, N. W., Washington, D. C., from the George Washington University in accordance with the action of the Council at its Second Meeting held in Rapid City, S. Dak., on Monday, August 26, 1929. (See page 959, JOURNAL A. PH. A. for Sept. 1929.)

Chairman Dunning also advises that negotiations are completed for the purchase of Lots 16, 17, 801 and 802 in Square 62, and that the purchase will be completed within a short time.

E. F. KELLY, *Secretary.*

CHEMICAL MUSEUM PLANNED.

A museum of industrial chemistry is being established at Long Island University, Brooklyn, under the supervision of Prof. Elmer S. Sargent of the chemistry department. It will contain exhibits of chemical products in various states of manufacture including dyestuffs, artificial silk and materials from which it is made, raw materials for perfumes, drugs, medicines, flavoring extracts and various other items. As soon as the collection has been enlarged and encased it will be opened to the public.

THE KALAUPAPA LEPROSARIUM TO BE ABANDONED.

The program designed to eliminate the Kalaupapa Leprosarium, which has been in existence since 1866, but which has fallen into a state of virtual decay, includes the enlargement of the existing Kalihi receiving station at Honolulu so that 500 patients may be cared for, this station eventually to become the only leprosarium in the territory.

PHARMACIST, DRUGGIST, APOTHECARY?

Wilbur B. Goodyear, *Chairman* of the Business Practice Committee, Pennsylvania Pharmaceutical Association, has submitted the following. Comment has been made in the JOURNAL heretofore and the subject will be discussed in succeeding issues, because it is of importance. Mr. Goodyear writes:

"The question of using the title 'Druggist' or 'Pharmacist' for proclaiming virtues of 'Drugs' in this modern day, has been debated in many of the State Associations, the AMERICAN PHARMACEUTICAL ASSOCIATION sponsors and advises the use of the term 'Pharmacist.'

Webster defines:

Apothecary: One who prepares and dispenses medicines and drugs for profit; one licensed to prescribe, a pharmacist.

Druggist: A dealer in drugs—an apothecary.

Pharmacist: One skilled in pharmacy, a druggist; pharmaceutical chemist.

The term Apothecary is considered obsolete but is still used by some well-to-do men in Pharmacy.

A large number of men in Pharmacy contend the term 'Druggist' has aided the patent medicine vendors in their malpractice with drugs and in confusing the public regarding our stores; it is common idea with the public that these stores are identical with ours.

The term 'Pharmacist' signifies 'ALL' in our professional service to the public. We take up 'Pharmacy,' we get a degree in 'Pharmacy,' our state board says we are a 'Registered Pharmacist' and becoming a R.P. we have the privilege to use the word 'Drug' exclusively, also to compound 'Prescriptions' and sell chemicals.

If we make the public 'Pharmaceutically'-minded, we will be taking a step in the right direction and also making a decided line of demarcation in the two types of stores that are on the firing line retailing 'Medicines.'"

"'JOHN DOE—PHARMACIST' OR 'DOE'S PHARMACY'

implies and conveys to the public that either one is a 'drug store' and that the proprietor is a lawful seller of 'drugs.'

In a spirit of usefulness to the future generations in 'Pharmacy' may we endeavor to make this change now, surely this is a 'cause' for all *representative men* in Pharmacy to *stand and identify themselves for*—now is the time to say *I am not ashamed of the colors I fly* and let us fly them just high enough to do honor and glory to American Pharmacy.

As *Chairman* of the Business Practice Committee of the Pennsylvania Pharmaceutical Association I ask you to debate this important subject in one of your future meetings and report your decision to me, also any other matter coming under the above-named committee."

EDITORIAL NOTES

Editor: E. G. Eberle, 10 West Chase Street, Baltimore, Md.

Members of the Council, A. PH. A.: S. L. HILTON, *Chairman;* CHARLES H. LAWALL, *Vice-Chairman;* E. F. KELLY, *Secretary;* H. V. ARNY, A. G. DUMEZ, H. A. B. DUNNING, H. C. CHRISTENSEN, C. E. CASPARI, J. H. BEAL, W. BRUCE PHILIP, T. J. BRADLEY. *Ex-Officio Members:* H. C. CHRISTENSEN, *President;* WALTER D. ADAMS, D. B. R. JOHNSON, *Vice-Presidents;* C. W. HOLTON, *Treasurer;* E. G. EBERLE, *Editor of the Journal;* A. G. DUMEZ, *Editor of the Year Book;* C. B. JORDAN, *Chairman of the House of Delegates.*

Collaborators: The Members of the Council; E. FULLERTON COOK, *Chairman,* U. S. P. Revision Committee; E. N. GATHERCOAL, *Chairman,* N. F. Revision Committee; Chairmen of the Sections, A. PH. A.; E. E. SWANSON, B. V. CHRISTENSEN, RALPH E. TERRY, JOS. G. NOH, J. T. LLOYD; J. W. STURMER, *President,* A. A. C. P.; CHARLES B. JORDAN, *Chairman,* Executive Committee, A. A. C. P.; W. M. HANKINS, *President,* N. A. B. P.; HENRY C. CHRISTENSEN, *Secretary,* N. A. B. P.

ERRORS IN "COMMENTS ON SOLUTION OF MAGNESIUM CITRATE."

Errors of omission occurred in the article by Frederick Kleinschmidt, "Comments on Solution of Magnesium Citrate," JOUR. A. PH. A., 20 (1931), 48. In eleventh line subfigure "2" was omitted from formulas $(C_6H_5O_7)_2$, and at end of the article the equal sign between potassium hydroxide and potassium glucosate was omitted.

THE CAPPER-KELLY BILL.

It is to be hoped that in the further consideration of the Capper-Kelly Bill it will be held to its original purpose, a matter that should receive serious consideration because of its importance to the retail trade in its various divisions and indirectly affecting all citizens. The *N. W. D. A. Bulletin* says: "Throughout the debate on the bill the opponents of the measure manifested an astonishing ignorance of the intent and scope of its provisions and many who have heretofore pledged themselves to vote for the measure supported destructive amendments which they declared were necessary "for the protection of the consumer."

We are quoting elsewhere a discussion of a related subject by Lieutenant Governor Huber of Wisconsin.

Further consideration of resale price maintenance legislation was postponed beyond this session of Congress by vote on February 3rd of the Senate Committee on Interstate Commerce.

The action of the Committee involved both the Capper-Kelly Resale Price Bill (H. R. 11) and the bill (S. 240), introduced by Senator Capper of Kansas, to govern the distribution of trade-marked articles.

Postponement of the consideration of the Capper-Kelly Bill was agreed to by the Committee after the bill had been passed January 29th by the House carrying four amendments. The other bill (S. 240), concerning the resale of trade-marked articles, had been introduced early in the session by Senator Capper and had not been reported by the committee to the Senate.

CANADIAN HOSPITAL PHARMACY.

The Canadian Hospital quotes Dean G. A. Burbidge in the following: "Our Act always made hospital pharmacy work illegal unless conducted by a registered pharmacist, and to become a registered pharmacist in Nova Scotia one must serve four years in a drug store in addition to taking a 2-year course at the Maritime College of Pharmacy. This store service was felt unnecessary for hospital work and a handicap for hospitals that might desire to engage a pharmacist. Hence the Act was amended so that any person with matriculation qualifications may take the College course and become a hospital pharmacist. If such a person desires to become a registered pharmacist, he or she may do so by completing four years' drug store service. For the present the College course for hospital pharmacy is the same as for ordinary registration, but it may be thought desirable to add to it or to so modify it to better suit hospital needs. It is not the intention, however, to have a standard for hospital pharmacy in any degree lower than for drug store service. This matter was discussed fully by Dr. H. L. Scammell, field representative of the hospital department of the American College of Surgeons. Dr. Scammell expressed himself as strongly favoring the policy adopted in this province.

INFLUENCE OF MAGNESIUM SALTS ON STRYCHNINE OR COCAINE POISONING.

Hypodermic injection of 0.2 Gm. of magnesium sulphate per kilo body weight in rats causes a slowing of the respiration; with 0.4 to 0.7 Gm. narcosis lasting for thirty minutes is produced; with 0.8 to 1.0 Gm. the narcosis lasts for an hour; and longer with still larger doses. Combined injection of magnesium and strychnine increases the mortality among rats, death resulting from paralysis of the respiratory center. Cocaine combined in the injection with magnesium sulphate exerts an antagonistic effect on the central nervous system, but the cardiac action is a summation of the effects of the two drugs. Magnesium sulphate, cannot, therefore, be employed as an antidote for strychnine or cocaine poisoning.—S. V. Ziganov (*Zhur. exper. Biol. Med.*, 12 (1930), 252; through *Chem. Abstr.*, 24 (1930), 2196).

FUNDS SUBSCRIBED TO ST. LOUIS DRUG SURVEY.

Drug manufacturers, wholesalers and other interests in the drug and allied trades have thus far pledged a total of $18,956.50 to the St. Louis survey now being carried on under the direction of the U. S. Department of Commerce.

The total cost of conducting the thorough study of the operation of nine drug stores in St. Louis and one in a nearby small town is estimated at from $100,000 to $125,000; about one-half of this amount will be provided by the federal government, the remainder must come from other sources. According to the committee, there are many who have not subscribed who have either not been approached or who have not had the importance or the scope of the work properly brought to their attention.

GENEVA NARCOTIC CONFERENCE.

President Hoover has commended legislation for favorable action authorizing an appropriation of $35,000 for the expenses of participation by the United States in the Conference on Limitation of the Manufacture of Narcotics to be held in Geneva, Switzerland, on May 27, 1931.

ALLEGED COUNTERFEITING OF ALLONAL.

Caught, it is charged, in the act of selling allegedly counterfeit "Allonal" to a druggist, a man was arrested in New York City last month. Indicted by the Grand Jury, he was held in $2500.00 bail for trial in general sessions court.

The alleged sale was made in the doorway of a building on Broadway, where the man apparently had arranged a meeting with his customer to deliver the product. The accused was trailed to the spot by a special investigator and Detectives Barrett and Vaughn of the safe and loft squad of the New York Police Department, who had been assigned to work with the investigator in breaking up drug counterfeiting.

EFFECT OF CHAIN STORES ON LIFE OF COMMUNITIES.

BY HENRY W. HUBER.*

The following paragraphs are quoted from the *U. S. Daily* of February 2nd:

"The day of reckoning has come with chain stores that are fast driving the country storekeeper to the wall, with consolidations of enterprises to stifle competition and boost prices on the consumer and with a growing financial dictatorship that tells the farmer what will be paid for his crops—not what the crops are worth in labor and industry.

"The chain store is a vital question, that strikes to the very lifeblood of society. This question is not only attracting the attention of the people of Wisconsin, but of the whole Nation.

"What has become of the neighbor who ran a grocery store and bought the products of the near-by farmer? He has been crowded out by the chain grocer. Maybe members of the community may save a few pennies on a package of raisins or a dozen oranges, but they have lost a real citizen in their community. In the place of the home grocer has come the clerk for the chain grocery, whose home is in some far-away city and who is interested only in sales, the profits of which take wing out of the community.

"The chain store issue is a form of monopoly that strikes at the very root of the home. Ordinarily, in discussing a monopoly the effect has been so far away that people cannot readily understand the evil of the system. But in the chain store monopoly people will become interested. It is the greatest evil of any system of monopoly that has ever come into existence, because it aims at the home.

* Lieutenant Governor of Wisconsin in *U. S. Daily*.

"Should the chain store monopoly securely fasten itself upon Wisconsin, our children's children will be like peasants and the property which rightfully belongs to them will be owned and controlled by absentee landlords in the large community centers."

PERSONAL AND NEWS ITEMS.

Mr. and Mrs. Israel Shurtleff observed their golden wedding, Sunday, December 21st, with a family dinner at New Bedford's (Massachusetts) leading hotel. Reception was held Monday afternoon and evening at their home, 252 County Street. Mr. Shurtleff was born in Mattapoisett in 1849. He is a life member of the A. PH. A., a member of the N. A. R. D., Massachusetts College of Pharmacy, a life member of the M. S. P. A., an honorary member of New Bedford Druggists' Association. In the January 1927 number of the JOURNAL of the AMERICAN PHARMACEUTICAL ASSOCIATION, there is a sketch of Mr. Shurtleff, in which comment was made that he had been eminently successful in business and is held in esteem by members of the profession, business men and the citizens of his home city.

Mr. and Mrs. Thomas W. Jones, Los Angeles, Calif., celebrated their golden wedding anniversary on January 11th, and were at home to their many friends for the occasion. Mr. Jones was secretary for a number of years of the Los Angeles and Southern California Association, and for five years of the California Pharmaceutical Association. Mr. Jones is known as "the grand old man of pharmacy" in California. Congratulations and good wishes are extended.

Linwood A. Brown, member of the Kentucky Board of Pharmacy for two 5-year terms, is leaving the Board and will probably be succeeded by **R. Lee Cassell** of Lexington.

Wm. N. Littell, 85 years young, of Mt. Arlington, N. J., a charter member of New Jersey Pharmaceutical Association, attended the mid-winter meeting of New Jersey Pharmaceutical Association.

Dr. Charles H. Rogers, of the department of pharmaceutical chemistry of the University of Minnesota, will leave in March for Europe, where he will join Mrs. Rogers who has been spending the winter in Spain and northern Africa. Besides touring through the principal continental countries, Dr. Rogers will carry on some studies and will return to Minneapolis in time for the fall quarter.

Prof. Arnold J. Lehman is now a member of the staff in the Department of Pharmacology, Stanford Medical School. He was formerly a member of the faculty of the School of Pharmacy, University of Washington.

Wm. J. Stonebach gave an illustrated lecture before the Riverside Kiwanis Club on "Various Vegetable Poisons."

Hossein Amin is Chief Inspector of pharmacists in the Department of Public Health, at Cairo, Egypt. At the present time there is an exhibit showing ancient and modern pharmacy at the agricultural and industrial exposition in Cairo. Dr. Amin studied pharmacy in this country, receiving his degrees from the Philadelphia College of Pharmacy and Science and Temple University.

Dr. I. V. Stanley Stanislaus was honored by the Brooklyn College of Pharmacy in recognition of his thirty-five years of service as teacher in pharmacy. On this occasion a beautiful gold watch was presented to him.

A sound film of Dr. John Jacob Abel, of the Johns Hopkins Medical School, lecturing on "The Relation of Pharmacology to Chemistry," is being made under the auspices of the Chemical Foundation of New York and the Johns Hopkins University. Dr. Abel is well known to pharmacists for his researches on the chemistry of the secretion of the ductless glands.

Chief Pharmacist Laurence Oliphant Schetky, U. S. N., has been promoted to the rank of Lieutenant Medical Corps on the retired list of the Navy.

Dean Ernest Little sailed with his family for Europe on February 3rd to be gone for about eight months.

O. U. Sisson, member of the A. PH. A., was elected president of the Chicago Retail Druggists Association at its recent annual meeting.

John W. Dargavel, one of the *Vice-Presidents* of the A. PH. A., was reëlected *Secretary* of the Minnesota State Board of Pharmacy. This is the 9th election. Mr. Dargavel is also *First Vice-President* of the N. A. R. D.

John D. Rockefeller, Jr., has been selected to receive an award of the first gold medal of the One Hundred-Year Club of New York City. The stated object of the Club is to preserve and perpetuate the worthy traditions and high ideals of business and professional life in the city of New York, and to coöperate with the new generation of business men.

Dr. Leonard Harrison Cretcher, has been elected as Assistant-Director of the Mellon Institute of Industrial Research, Pittsburgh.

Dr. Cretcher was connected for a time with the Rockefeller Institute and during the World War was in the Chemical Warfare Service. He has contributed to the knowledge of glycol ethers and esters, chloro ethers, etc.

Dr. Lawrence W. Bass, for several years member of the Executive Staff of Mellon Institute, is now Assistant-Director of Research of the Borden Co., New York.

Dr. Lloyd K. Riggs, director of Research of the New Jersey College of Pharmacy, recently spoke before the Rotary Club on the "Importance of Vitamins to the Human Organism."

The *Bulletin of the Massachusetts College of Pharmacy,* for December, gives alphabetical and geographical lists of the graduates of Massachusetts College of Pharmacy. The addresses of the classes from 1869 up to the present are also given, making a convenient and useful reference.

Dr. Alfredo C. Santos, of the Department of Pharmaceutical Chemistry, of the University of the Philippines, has favored us with a reprint of his contribution on "The Alkaloid from Anona Reticulata L."

Carl G. A. Harring, secretary of the American Conference of Pharmaceutical Secretaries, has assumed the editorship of *The Apothecary.* Announcement is made in the January number by greetings of the new editor, to whom best wishes are extended.

The Messenger, published by the College of Pharmacy of the City of New York, Columbia University, of which the editor is **Prof. Curt P. Wimmer,** has added a section entitled, "Pharmaceutical Review." Under this heading *The Messenger* will present monthly abstracts of articles, editorials, etc., appearing during the month previous in pharmaceutical publications of the United States. The first of these reviews appeared in the January number and are informative and of general pharmaceutical interest.

Arthur D. Little was formally awarded the Perkin Medal on January 9th, in Havemeyer Hall, Columbia University. The subject of the address of the Medalist was "The Evaluation of Chemical Projects."

Dr. James R. Thayer, for some time assistant professor in California College of Pharmacy, has been elected professor of theoretical and practical chemistry at St. Louis College of Pharmacy.

President Lawrence S. Williams, of Maryland Pharmaceutical Association, is not only a collector of show globes (he has about fifty of them), but uses them in displays and as insignia of his pharmacy.

Sinclair Jacobs has opened a Jacobs Pharmacy at Five Points, Atlanta. It is modern and serves as a memorial to his father, who opened his first pharmacy at this location; appropriate opening ceremonies were held.

H. A. Kinnamon, Baltimore, is making a success with his pharmacy—prescriptions only, and he sticks strictly to that; as a result the number of prescriptions he fills has doubled during the past six months.

G. S. Preston, Knoxville, Tenn., has opened the Preston Apothecary Shop; he only dispenses prescriptions in this pharmacy.

Mrs. Edward Swallow, widow of our late fellow member has donated a number of volumes to the Library of the Headquarters Bldg.—Thanks are extended.

The Willard Gibbs Medal for 1931 has been awarded by the Chicago section of the American Chemical Society to Dr. Phoebus A. Levene of the Rockefeller Institute for Medical Research "as the outstanding American worker in the application of organic chemistry to biological problems."

Award of the William H. Nichols Medal of the New York Section of the American Chemical Society for 1931 to Dr. John Arthur Wilson, of Milwaukee, Wisconsin, is announced. The award is bestowed for outstanding achievement in colloid chemistry.

Dr. Herbert Levinstein, the English chemist, has been awarded the medal of the Society of Chemical Industry. The medal is awarded not more frequently than once every two years by research, discovery, invention or improvement. Dr. Levinstein did much work on the British Chemical Warfare Committee and is known as an authority on poison gas.

Henry Ruffin Horne—prominent in North Carolina pharmacy, father of **Warren Winslow** and **Samuel R. Horne,** members of the AMERICAN PHARMACEUTICAL ASSOCIATION—died January 13th, after a brief illness. A sketch, which pays deserved tribute to the deceased, appeared in the *Carolina Journal of Pharmacy* for February. The biographer expresses "his veneration for the lovable type of old school gentleman, whose ninety-two years were lived so gracefully, so effectively and so honorably."

Sympathy is expressed to our fellow members.

OBITUARY.

ISAAC EDWARD EMERSON.

Isaac Edward Emerson, drug manufacturer and banker, founder of the Emerson Drug Company, died January 23rd at his home in Baltimore after two months' illness. He was seventy-one years old. He was familiarly known as captain, having received a commission as such during the Spanish-American War when he provided the entire crew for the U. S. S. *Dixie*. Captain Emerson was a member of many clubs, including the New York Yacht Club, the Maryland Yacht Club and other organizations.

Mr. Emerson was born at Chapel Hill, N. C., July 24, 1859, and was graduated from the University of North Carolina as a chemist in 1879. A year later he came to Baltimore and opened a small drug store in the northwest section of the city. He later organized the Emerson Drug Company, built the Emerson Hotel, and had large hotel and realty holdings at Narragansett, R. I.

Captain Emerson served as president of the Citro Chemical Works of America at Maywood, N. J.; chairman of the American Bromine Company, and was controlling owner of the Maryland Glass Corporation, reputed largest manufacturer of blue glassware in the country. He was a director of many banking institutions and a member of the AMERICAN PHARMACEUTICAL ASSOCIATION.

According to statements made in connection with the filing of the will of Captain Isaac E. Emerson, the estate has a valuation of $20,000,000. Among associates who have been holding positions of trust under Captain Emerson for many years and who benefit largely by his munificence are Joseph F. Hindes and Philip I. Heuisler, of the Emerson Drug Company and the Maryland Glass Company; William H. Parker, manager of the Emerson Hotel; and Parker Cook. Captain Emerson's controlling interest in the stock of the Emerson's Bromo-Seltzer, Inc., Emerson Drug Company, Maryland Glass Corporation and the Emerson Hotel is left in trust for a period of twenty years. Ten trustees are named, who also are to be executors of the will and directors of the corporations. They are Anne Preston Emerson, the widow; Margaret E. Heuisler, Parker Cook, J. Edward Murray, Walter W. White, Frederick C. McCormack, William H. Parker and Vernon Cook. Captain Emerson stated in his will that he desired all promotions of officers in his various corporations to be in the following order of priority: 1, Joseph Hindes; 2, Philip I. Heuisler; 3, Parker Cook; 4, Edward Murray; 5, Walter W. White; 6, Frederick C. McCormack. Others benefit by the will, and Captain Emerson's interest in his employees is shown by these provisions. Several years ago he established a chair in the University of Maryland, School of Pharmacy, and endowed it.

Captain Emerson is survived by his widow, his daughter, Mrs. Minot, and two grandchildren, Alfred Gwynne Vanderbilt, Jr., and George Vanderbilt; there are also several stepchildren.

OLIVER F. WOLF.

Oliver Franklin Wolf, Pittsburgh, Pa., president of the McKennan Drug Company, Inc., died October 23rd at his winter home in Phoenix, Ariz. Mr. Wolf was born in Pittsburgh and became sole owner of the McKennan pharmacy in 1914. He was a member of the AMERICAN PHARMACEUTICAL ASSOCIATION, the National Association of Retail Druggists, the Keystone Athletic Club, the Pittsburgh Chamber of Commerce. The deceased was a member of the Masonic bodies and the Shrine. He is survived by his widow, Mrs. Addie S. Mudge Wolf, and a brother, Edward G. Wolf of New York.

WILLIAM CHARLES KIRK.

William Charles Kirk of 782 West End Avenue, chief chemist of Fairchild Brothers & Foster, died November 30th, in St. Luke's Hospital, aged 67 years. He was a native of Chicago and a graduate of the University of Illinois, class of '85. A widow, Emma L. Cappus Kirk, and two children survive. Mr. Kirk was a member of the American Chemical Society and of the AMERICAN PHARMACEUTICAL ASSOCIATION.

William C. Aughinbaugh, pharmacist, of Hagerstown, Md., died at his home on January 3rd. For a number of years, and until his death, he owned and conducted a successful pharmacy in Hagerstown. He also was president of Kee Mar College and took an active interest in the school.

Dr. Paul M. Lowell, Medical Officer of the Food and Drug Administration, U. S. Department of Agriculture, died January 3rd at Walter Reed Hospital, of pneumonia. Dr.

Lowell joined the Food and Drug Administration as Medical Officer in 1927 and was in charge of the preparation of court cases based upon fraudulent therapeutic claims for drugs and medicines.

Dr. Allen Johnson, 60, author and former professor of history at Yale, and editor of the *Dictionary of American Biography,* died in Washington, D. C., January 18th, following an automobile accident. Dr. Johnson had completed six volumes of the contemplated 20 volumes designed to incorporate the biographies of 13,000 famous Americans.

Narakichi Hishida, publisher of the *Japanese Weekly Druggist* passed away at the age of 68 years at his Tokyo home on January 8th. The funeral service was held at Itokuji Temple at Akasaka, on January 11th.

SOCIETIES AND COLLEGES.

NEW YORK PHARMACEUTICAL CONFERENCE AND UNEMPLOYED PHARMACISTS.

In replying to the New York Pharmaceutical Conference relative to the action of New York's Pharmaceutical organizations, Secretary Kelly said:

"Pharmacy Takes Care of Its Own." This motto may very correctly be applied to Pharmacy not in any spirit of pride but rather in a spirit of thankfulness that we have been able and prepared to deal with our own problems, be they social, professional or economic. In all of its long history Pharmacy has been fortunate enough to maintain itself.

"It has been said that pharmacists as individual citizens do not take the interest that they should in civic and political activities. An investigation will soon show that this is not true, but it may be that pharmacists believe in that old-fashioned, very wise and dependable policy that if the various groups of society take care of their own troubles, there will be much less for society to deal with as a whole.

"It is, therefore, most encouraging to see The New York Pharmaceutical Conference taking effective steps to meet such unemployment and consequent want as may occur among pharmacists in its territory during the present conditions. It is a splendid cause and deserves, as we confidently expect it to receive, the wholehearted support of the members of the Conference. To undertake such a humanitarian effort is a compliment to the Conference and to its members, and the AMERICAN PHARMACEUTICAL ASSOCIATION wishes it the fullest measure of success."

CANADIAN CHEMISTS FORM ASSOCIATION.

The Canadian Chemical Association has been formed by chemists and chemical industrialists of Canada by the consolidation of previously existing Canadian chemical societies. The new association will be concerned with developments in all lines of chemistry and its applications, and also function along educational and research lines. The officers of the Association are: *President,* J. R. Donald, Montreal; *Secretary,* J. Houston, Toronto.

EIGHTH INTERNATIONAL DENTAL CONGRESS.

The 8th International Dental Congress will be held in Paris, France, August 3–8, 1931. At this time the most recent advances in the dental profession will be demonstrated. It is expected that quite a number of delegates from the United States will attend.

MERGER OF NEW YORK MEDICAL SCHOOLS.

The incorporation of the New York Postgraduate Medical School and Hospital, into the educational system of Columbia University has been announced. Dr. Nicholas Murray Butler has been elected a member of the Corporation and director of the Post-Graduate Medical School and Hospital, of which he becomes ex-officio president.

RESEARCH BUREAU.

The directing committee of the Research Bureau for the year 1931 is as follows: A. K. Mayer, *Chairman,* Indianapolis; J. H. Riemenschneider, *Vice-Chairman,* Chicago; E. L. Newcomb, *General Secretary;* S. C. Henry, Chicago; Sidney Hollander, Baltimore; Ambrose Hunsberger, Philadelphia; Carl F. G. Meyer, St. Louis; H. S. Noel, Indianapolis; Paul C. Olsen, Philadelphia; Alfred W. Pauley, St. Louis; G. C. Schicks, Newark; Wm. J. Schieffelin, Jr., New York; J. T. Woodside, Chicago.

Under the plan recently adopted for financing the work of the Research Bureau ample provision has been made for increased activity along the lines most beneficial to every retail druggist in the country, regardless of location or prevailing business conditions.

AMERICAN DRUG MANUFACTURERS' ASSOCIATION.

President S. Barksdale Penick has announced that the next annual meeting of the American Drug Manufacturers' Association will be held at the Cavalier, Virginia Beach, May 4th–7th. At this time the program has not been completed but it is stated that many subjects of vital interest to the membership will be discussed and there is reason to expect a very large attendance.

PHILIPPINE PHARMACEUTICAL ORGANIZATIONS.

(*This revision will be inserted in March Roster.*)

The following constitute the present members of the Philippine Board of Pharmaceutical Examiners and Inspectors:

President, Pedro T. Maglalang; *Members*, Dr. José E. Jimenez; Florencio Gavino; Dr. José V. Gloria, *Permanent Secretary* of the Board of Medical, Pharmaceutical, Dental, Nurses and Optical Examiners; Felipe Concepcion, *Chief*, Drug and Pharmacy Division; Attorney Ambrosio Umali, *Chief Clerk and Disbursing Officer*, Board of Examiners.

Philippine Pharmaceutical Association.—*President*, Dr. Patrocinio Valenzuela, School of Pharmacy, University of the Philippines; *First Vice-President*, Servando de los Angeles, 418 Legarda, Manila; *Second Vice-President*, Felipe Concepcion, 317 B, Perdigon, Manila; *Secretary*, Dr. Alfredo C. Santos, School of Pharmacy, University of the Philippines; *Vice-Secretary*, Miss Lourdes Basa, 514 San Nicolas, Manila; *Treasurer*, Miss Clara M. Aragon-Villaneuva, 1460 Herran, Paco, Manila; *Assistant Treasurer*, Miss Leticia Antonio, 889 Nara, Palomar, Manila.

Board of Directors.—Pedro T. Maglalang, Dr. Eugenio Quesada, Dr. Dionisio A. Llamas, Dr. José V. Gloria, Filemon Tanchoco, Miss Dolores Paterno, Primo Arambulo, Miss Carmen del Mundo.

Board of Management *Journal of the Philippine Pharmaceutical Association.*—Dr. Leon Ma Guerrero, *Chairman;* Dr. Felix Hocson, *Member;* Dr. Patrocinio Valenzuela, *Member ex-officio.*

Editorial Staff.—*Editor*, Servando de los Angeles; *Associate Editors*, Apolonio R. Chavez, Dr. Patrocinio Valenzuela, Dean Antonio G. Llamas, Dr. Alfredo C. Santos.

Business Management.—*Business Manager*, Dr. José E. Jimenez; *Assistant Managers*, Felipe Concepcion, Ernesto Maglalang.

NORTH CAROLINA LEGISLATION.

Resolutions condemning that part of the North Carolina Assembly report on proposed organization which would abolish the State Board of Health, the State Board of Medical Examiners, the Pharmaceutical Examiners and the Examining Board of Nurses, and transferring their duty to the State Board of Education, were adopted at a meeting of representatives of these various bodies.

UTAH PHARMACEUTICAL ASSOCIATION.

At a meeting of the Executive Board of the Utah Pharmaceutical Association plans for the 1931 convention were discussed, and the following committee appointments were made by President H. S. Ensign: *Legislative*, Archibald Bevan, *Chairman;* Henry E. Peterson, Charles Stoffel, P. B. Van Orden, Frank Ulrich and Charles Van Dyke; *Program*, Walter Dayton, *Chairman;* Eugene E. Carr, Anthony H. Lund and Alex Hedquist; *Finance*, George Reed, *Chairman;* W. V. Dyer and Charles Empey; *Resolutions*, Ed Johnston, *Chairman;* F. R. Anderson and Herbert Wessman; *Board of Pharmacy*, Harry L. Thompson, *Chairman;* H. H. Peterson and A. D. Sutton; *Membership*, Harry Coombs, *Chairman;* C. E. Athas, W. L. Anderson, D. L. Fairweather, Fred Evans, H. V. Waggener and E. H. Hartman; *Arrangements, Jacob A. Johnston, Chairman;* Charles Watson, Walter Lloyd and C. J. Harvey.

WEST VIRGINIA PHARMACEUTICAL ASSOCIATION.

Secretary J. Lester Hayman announces that plans are well under way to celebrate the silver anniversary of the West Virginia Pharmaceutical Association at Wheeling, June 17th–18th. It is hoped at this time to hold the Veterans' luncheon and organize a State Veteran Druggists Association. Secretary Hayman requests that those who are interested in the latter organization should write to him.

The Colorado Pharmacal Association will hold its 1931 meeting at Troutdale-in-the-Pines, June 16th, 17th and 18th.

At a meeting of the officers of the Oklahoma Pharmaceutical Association plans were made for the annual meeting to be held in Clinton, April 21st–22nd. The prospects are for large attendance.

Maine Pharmaceutical Association held a mid-winter meeting Friday, February 13, 1931, at Augusta House, Augusta, Me.

NEW YORK PHARMACEUTICAL CONFERENCE.

Members of the New York Pharmaceutical Conference have elected Harry H. Miller, New Rochelle, N. Y., as president of the organization for the third consecutive year. Other officers elected are: *First Vice-President*, Harry Goldschmidt; *Second Vice-President*, Samuel Dreyer; *Third Vice-President*, Albert Friedman; *Secretary*, George S. Harkavy and *Treasurer*, S. S. Dworkin.

The Conference has a campaign under way to raise $50,000 for the relief of needy and unemployed pharmacists of the city; to aid in this, a banquet was held January 25th at the Hotel Commodore, at which time more than $7000 were raised. The fund will be in charge of a special distributing committee composed of Thomas J. McHugh, R. D. Keim, Dr. H. V. Arny, Dr. S. W. Wynne, I. H. Bander, A. R. M. Boyle and H. H. Miller.

Among the speakers at the banquet were: Charles H. Tuttle, former U. S. Attorney; Shirley W. Wynne, Health Commissioner and Samuel Antonow. More than 1500 were present at the banquet.

NORTHERN OHIO DRUGGISTS ASSOCIATION.

President Julius H. Riemenschneider of the N. A. R. D. was the guest of honor at the annual installation of officers of the Northern Ohio Druggists Association, January 8th, held in the rooms of Cleveland Chamber of Commerce. The officers for 1931 are: *President*, Peter Kadel; *First Vice-President*, Joseph Matousek; *Second Vice-President*, Erwin Steiner; *Sergeant-at-Arms*, S. J. Sternicki, Abraham Butnik; *Board of Control*, Walter G. Conrad, Albert P. Gegenheimer, Joseph Matousek and Eugene Remy.

DETROIT RETAIL DRUGGISTS ASSOCIATION.

Bernard Bialk, Secretary of the Detroit Branch of the A. Ph. A. was reëlected President of the Detroit Retail Druggists Association at its recent annual meeting. The other officers of the Association are:

First Vice-President, Adam Pryzyblski; *Second Vice-President*, Stan Rogers; *Treasurer*, George E. Doyle; *Executive Committee:* Clare F. Allan, Fred C. Bellemoere, Joseph J. Burniac, J. M. Ciechanowsky, A. J. Filer, Max Kritt, Leo J. LaCroix, J. Ed. Richardson, Paul Saylor and E. P. Tobin.

OFFICERS PHILADELPHIA DRUG EXCHANGE.

The following officers were elected by Philadelphia Drug Exchange for the ensuing year: *President* (reëlected), John F. Belsterling; *Vice-President* (reëlected), Harrison S. Hires; *Secretary* (reëlected), Joseph W. England; *Treasurer*, F. L. Bodman. The following directors were elected: E. L. Brendlinger, Alexander C. Fergusson, Jr., H. K. Hineline, Herbert R. McIlvaine, Walter P. Miller, J. Mervin Rosenberger, Walter V. Smith and Benjamin S. Thorp.

The Exchange had its annual dinner in the Bellevue-Stratford Hotel, Thursday evening, January 29th. A musical program was given during the dinner. Afterward Utley E. Crane, municipal court judge, spoke on "From Washington to Hoover—and Whither," and the Rev. Ross H. Stover spoke on "Mixed with Drugs."

Prof. Louis Saalbach spoke before the Pitcairn Kiwanis Club, February 5th, on "The History of Pharmacy;" three members who studied under Professor Saalbach were in attendance—**David P. Lutz, J. Lloyd Grimm** and **Fred Woods.**

BOOK NOTICES AND REVIEWS.

Bioassays—A Handbook of Quantitative Pharmacology. By James C. Munch. X plus 958 pages. The Williams & Wilkins Co., Baltimore. Price $10.00.

The title and subtitle indicate the double point of view of the book: bioassay, the practical assay of samples of medicines; and quantitative pharmacology, an instrument and object of scientific investigation; the bioassay which aims to standardize the Known; and the quantitative pharmacology which looks to the discovery of the Unknown. The

latter is coextensive with pharmacologic research, which eventually turns to the quantitative, the ambition of all science. The reactions of the living body with chemical substances offer an infinity of problems of absorbing scientific interest as well as of great practical significance to the human race, and the field of pharmacologic research is being cultivated with great intensity. As the problems shift and vary, new methods and points of view are developed. The theory of yesterday becomes the practice of to-day, the historical of to-morrow, then, the obsolete, and sometimes again the starting point of the new. In the bewildering activity of science, a knowledge of what has been done, a command of the "literature," becomes more and more imperative, but more and more difficult of attainment. Research runs in danger of being smothered by the products of its activity, unless it devises methods of organizing these products so as to render them reasonably accessible. One of the most practical methods of this orientation remains their digestion, critical selection and systematic orientation by experienced workers in the field. The present volume belongs to this class.

The book is a well-arranged guide to the extensive literature of quantitative pharmacology, sufficiently detailed to show the present status of each subject, and to orient the reader in the general directions and specific sources where further information may be sought. The presentation of the individual citations is generally objective rather than critical, but the "conclusions" at the end of each topic supply the welcome opinions of a man who is experienced in the field. There is no attempt to exhaust the papers; much of the material is presented in the numerous tables (which would be improved by citing the sources of the information in the tables themselves, instead of requiring the user to search through the text); but for details, especially of the methods, the reader is remanded to the original papers, which are presented by the systematic bibliographies of over 5000 titles, and by extensive and convenient indices. The general avoidance of exhaustive (and exhausting) detail of technic is an aid to orientation, although it may be a disappointment to the technician, to the inexperienced seeker of the rule of thumb, who is looking for a short cut to the little knowledge that is a source of self-deception. This is one of the recommendations of the book. In bioassaying, as in other laboratory work, there is room for the honest technician, who, under competent supervision, acquires more or less insight into the subject; but the intelligent application of quantitative pharmacology to any task requires something more than a sheet of working directions. It demands a critical judgment, based on a sound grasp of fundamental principles, plus a broad knowledge of the literature, plus a specialized experience, plus good sense. Those who possess the last and first of these qualifications will find the book a valuable aid in acquiring the literature and the experience. It fills a place that has hitherto been vacant, and it fills it well. It is a credit to the author, whose labor has been well expended to the benefit of the subject and of the serious workers in the field.—TORALD SOLLMANN.

The Chemist and Druggist Diary, 1931. Sixty-third year of publication. Chemist and Druggist, London.

"*The Chemist and Druggist Diary* has many merits, but it excels in the progressiveness which takes the form of adaptation to and provision for new requirements in pharmaceutical business and practice. In this issue all the standing features, notably the Buyers' Guide and the Legal Section, have been brought up-to-date. The familiar list of registered formulas has perished in the massacre of the innocents by the Board of Customs and Excise, but as a succedaneum we are given a selection of American Formulas. There are two excellent illustrated articles, *viz.*, Pharmaceutical Manufacturing Apparatus, and The Optician's Workshop, which reveal to what an extent machinery has superseded manual operations in these industries, and every literary page contains something of practical value to the practising pharmacist."

The foregoing review is quoted from another publication, because it briefly, although not very completely, speaks of the *Chemist and Druggist Diary*. The book contains much information for the British pharmacists relating to laws, educational institutions, associations, etc. Its publication for 63 years speaks for its value.

DEATH OF DEAN E. V. HOWELL.

Just before closing this issue we have advice of the death of Dean E. V. Howell, Chapel Hill, N. C.